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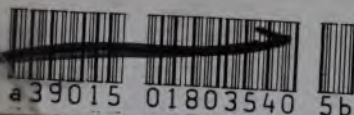
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FORESTRY

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SIXTH ANNUAL REPORT

OF THE

CHIEF FIRE WARDEN

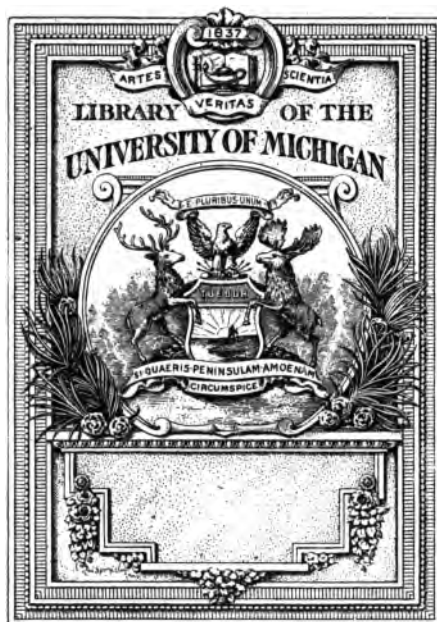
OF

MINNESOTA

UNDER THE ACT OF THE LEGISLATURE, ENTITLED
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE
AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND
PRAIRIE FIRES," APPROVED APRIL 15, 1900.

FOR THE YEAR 1903.

ST. PAUL, MINN.:
PRINTED BY THE PIONEER PRESS COMPANY.
1903.



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1900



1519



Logs principally cut from green and growing pine, but purporting to be from "dead and down" trees, on the west side of Pike Bay, Chippewa Indian Reservation, vicinity of Cass Lake. The logging that is being practiced on the Chippewa Indian Reservations by the United States Government is in contempt of forestry principles. Photographed, April, 1901, for the Annual Report of the Chief Fire Warden of Minnesota.

FORESTRY

SIXTH ANNUAL REPORT

OF THE

CHIEF FIRE WARDEN

OF

MINNESOTA

UNDER THE ACT OF THE LEGISLATURE ENTITLED
"AN ACT TO PROVIDE FOR THE PRESERVATION OF FORESTS OF THIS STATE
AND FOR THE PREVENTION AND SUPPRESSION OF FOREST AND
PRAIRIE FIRES," APPROVED APRIL 18, 1895.

FOR THE YEAR 1900.

ST. PAUL, MINN.:
PRINTED BY THE PIONEER PRESS COMPANY.
1901.

STATE OF MINNESOTA,
OFFICE OF CHIEF FIRE WARDEN, }
ST. PAUL, MAY 11, 1901.

Hon. R. C. Dunn, State Auditor and Forest Commissioner:

SIR: As required by section 3 of the Act for the Preservation of Forests, etc., approved April 18, 1895, I have the honor to submit, herewith, my annual report for the year 1900.

Very respectfully,

C. C. ANDREWS,
Chief Fire Warden.

SIXTH ANNUAL REPORT
OF THE
CHIEF FIRE WARDEN
OF MINNESOTA.

Since the fire warden system went into effect in 1895 fifty townships of Indian lands have been newly opened to settlement, hundreds of new homestead farms have been settled upon, three hundred miles of logging and other railways have been built and operated in the forest regions; there has also been continuous search for iron ore, also for pine lands which can be purchased under the Stone and Timber Act, to say nothing of the presence of many hunters, so that the danger of forest fires has increased rather than diminished. The spring of 1900 was the driest and most dangerous season that has occurred since the fire warden law was passed, and some people have asserted that it was as dry a period as the autumn of 1894, when the great Hinckley fire occurred. The number of forest fires which were reported as occurring in 1900 was 139, which burned over 179,521 acres and did damage to the amount of \$153,399. The number of prairie fires reported was 50; number of acres burned over, 213,240; damage, \$63,017. During the dry season as many as three hundred reports were received from fire wardens, and they are entitled to much credit for their public spirit and activity in preventing and controlling fires. The extracts printed from their reports will show more fully the character of their services. In a num-

ber of instances a great amount of property was saved from destruction by their efforts. Still better service could be had if the pay of fire wardens were more liberal. The area in which forest and prairie fires are liable to occur in Minnesota exceeds thirty million acres, and it may be presumed that some fires occurred in the unsettled and unorganized territory not covered by fire warden service.

As an example of the efficiency of the fire warden service may be mentioned the fire which occurred in the township of Moose Lake—eighteen miles long—in Carlton county, and which was discovered June 22nd on school section 36, township 46, range 20, two and one-half miles in a direct line from the village of Moose Lake, between which and the fire is dense woods. The fire appears to have been set in three different places by a hunter in order to make pasture for deer. But for the energy and activity of the chairman of the town board in calling out help and controlling the fire it would doubtless have spread to and destroyed the village of Moose Lake (in which a hundred pupils were attending school) and might have extended also north to Barnum. I subsequently visited the scene of the fire and was gratified to see the amount of work which had been done to prevent its spread. I found that the fire warden force had ditched and scraped the ground along the front of the fire about a mile, that a lane had been cut three hundred yards or more, that a great many trees had been felled, some of them two feet in diameter, many of them dead and hard, and that back-firing had been extensively done, all to hold the fire in check; and part of the time when this work was done the temperature was up to 90°. The fire warden force was employed eight and one-half days and nights controlling the fire, much of the time the wind blowing a gale. There was no one living within a mile of this fire, and if there had not been an officer whose duty it was to attend to it

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1900



A family of Chippewa Indians on the White Earth Reservation. Photographed, April, 1901. Almost the sole wealth of the Chippewa Indians is their pine forests. If these forests were managed on forestry principles the Indians would always have a comfortable support. Under the present practice they will become beggars. Ask your Senators and Representatives in Congress to have the forests on Indian Reservations administered on forestry principles.

the probability is that it would not have been controlled in time.

The first step in forestry is the prevention of forest fires. Without that there can be no forestry. Our Minnesota system is not perfect and can be improved, but it has proved more effective than that of any other state. The six years it has been in operation the damage from forest fires, according to the reports of fire wardens, has averaged only \$35,000 a year; and our forests at a conservative estimate are worth one hundred million dollars.

The fact that such devastating forest fires have occurred as that of September and October, 1871, in the region of Green Bay, Wisconsin, which swept over 400 square miles of territory, wiped out several villages, caused the loss of a thousand lives and more than three million dollars of property; as that of September, 1881, which ran over 48 townships in southeastern Michigan, in which 138 people perished, and property exceeding two million dollars was destroyed; and that of Hinckley, Minnesota, September, 1894, in which 418 people perished and a vast region was devastated, to say nothing of many others that have occurred, should be sufficient to induce reasonable legislators to adopt stringent measures for guarding against such possible calamities. To prevent the destruction of its scenery, to prevent the destruction of life and property and for its own rank in civilization any state that has considerable forest area is bound to use all reasonable means in its power for the prevention of forest fires.

An examination of the files of this office shows that there have been twenty-two prosecutions under the Fire Warden Law. Doubtless some others have occurred which have not been reported. It is unpleasant, of course, to have a fellow citizen, perhaps neighbor, prosecuted, but humanity and kindness are on the side of a rigorous, rather than a lax, enforcement of this law.

SUMMARY OF FOREST FIRES, 1900.

COUNTY AND TOWN.	Date.	Acres.	Dam- age.	Cause.	Controlled by Fire Warden or Helper.
Aitkin County—					
Township 51-27.....	Apr. 30-May 1..	50	None	Unknown.....	Yes.
McGregor	June 22	1,000	220	Unknown.....	Yes.
McGregor	June 22.....	2,000	200	Unknown.....	Yes.
Farm Island.....	May 20.....	200	.....	Unknown.....	Yes.
Glen.....	May 15.....	40	380	Unknown.....	Yes.
Glen.....	June 16.....	320	300	Unknown.....	Yes.
Glen.....	June 21.....	100	100	Unknown.....	Yes.
Nordlund.....	June 23.....	2,000 (Meadow)	500	Unknown.....	.....
Anoka County—					
Grow.....	June 19.....	1,200	300	R. R. locomotive....	Yes.
Becker County—					
Burlington.....	April 25.....	400	300	Unknown.....	Yes.
Height of Land....	May 6.....	6,000	5,000	Burning brush.....	Yes.
Silver Leaf.....	May 18.....	3,000	600	Unknown.....	Yes.
Two Inlet.....	May 5.....	700	100	Unknown.....	Yes.
Two Inlet.....	June 15-24.....	10,000	.....	Unknown.....	Yes.
Beltrami County—					
Bear Creek.....	April 25.....	3,000	2,350	Unknown.....	Yes.
Bear Creek.....	May 4.....	160	100	Burning brush.....	Yes.
Bemidji	May 24.....	200	100	River drivers.....	Yes.
Bemidji	May 25.....	100	50	River drivers.....	Yes.
Grant Valley.....	April 20.....	15,000	15,000	Unknown.....	Yes.
Holst.....	April 20.....	600	300	Unknown.....	.....
Itasca.....	April 26.....	1,000	150	Unknown.....	Yes.
Leon.....	April 26.....	10,000	2,500	Unknown.....	Yes.
Liberty.....	April 26.....	10,000	1,000	Unknown.....	Yes.
Pine Lake.....	May 10-12.....	20,000	2,000	Burning brush.....	Yes.
Port Hope.....	May 10-12.....	320	600	Burning break.....	.....
Township 147-32....	May 21-23.....	640	1,000	Camp fire.....	Yes.
Township 148-30....	May 27.....	1,000	600	Camp fire.....	.....
Township 145-37....	April 10.....	160	None	Camp fire.....	Yes.
Township 145-37....	April 16.....	680	500	Unknown.....	.....
Township 145-37....	May 10.....	1,280	2,500	Unknown.....	.....
Township 145-37....	May 23.....	4,000	5,000	Unknown.....	Yes.
Moose Creek.....	April 20.....	20	500	Unknown.....	Yes.
Township 150-33....	April 20.....	3,000	3,500	R. R. locomotive....	Yes.
Township 150-34....	May 10.....	4,000	2,000	Unknown.....	.....
Township 147-33....	May 5-8.....	2,500	2,000	Unknown.....	Yes.
Benton County—					
Glendorado.....	April 18.....	40	40	Unknown.....	.....
Carlton County—					
Kalevala.....	June 26.....	300	150	Unknown.....	Yes.
Kalevala.....	June 29.....	1,300	105	Unknown.....	Yes.
Mahtowa.....	June 26.....	.....	None	R. R. locomotive ..	Yes.
Mahtowa.....	June 26.....	.....	None	R. R. locomotive ..	Yes.
Mahtowa.....	June 27.....	400	600	R. R. locomotive ..	.....
Moose Lake.....	June 22.....	400	1,000	Unknown.....	Yes.
Moose Lake.....	June 26-28....	40	125	Unknown.....	Yes.
Red Clover.....	June 16.....	300	200	Unknown.....	Yes.

SUMMARY OF FOREST FIRES, 1900—Continued.

COUNTY AND TOWN.	Date.	Acres.	Dam- age.	Cause.	Controlled by Fire Warden or Helper.
Carlton County— <i>Cont.</i>					
Red Clover.....	June 25.....	800	500	Unknown.....	Yes.
Red Clover.....	June 26.....	1,000	600	Tramp.....	
Thomson.....	June 17.....	160	500	Clearing land.....	Yes.
Twin Lakes.....	June 6.....	1,200	4,000	Clearing land.....	Yes.
Cass County—					
Township 145-31....	April 26.....	300	1,000	Unknown.....	Yes.
Cook County—					
Maple Hill.....	May 11.....	1,500	500	Burning brush.....	Yes.
Maple Hill.....	May 21.....	2	15	Clearing land.....	Yes.
Crow Wing County—					
Daggett's Brook....	June 27.....	200	500	Unknown.....	Yes.
Township 47-28....	May 13.....	1,000	800	Unknown.....	
Township 135-28....	April 6.....	70	25	R. R. locomotive....	Yes.
Township 135-28....	May 19.....	200	100	.....	Yes.
Township 135-28....	May 26.....	50	20	.....	Yes.
Township 135-28....	June 4.....	400	125	Clearing land.....	Yes.
T'w'ps 136 & 137-29..	April 28.....	3,000	2,000	Clearing land.....	Yes.
Township 138-27....	May 27.....	4,000	3,000	Unknown.....	Yes.
Douglas County—					
Spruce Hill.....	July 26.....	1	10	Hunters.....	
Hubbard County—					
Arago.....	May 15.....	300	1,100	Unknown..	
Arago.....	June 20.....	600	1,000	Smoker.....	Yes.
Helga.....	April 20.....	500	20,000	Burning brush.....	
Henrietta.....	June 23..	160	50	Smoker.....	Yes.
Lake Emma.....	May 1.....	640	100	Campers.....	Yes.
White Oak.....	June 18.....	6,000	2,000	Unknown.....	Yes.
Township 143-34....	May 11.....	5,000	1,000	Hunters.....	Yes.
Township 143-35....	May 20.....	100	None	Indians.....	
Township 144-34..	April 16.....	100	500	Camp fire.....	Yes.
Township 144-34....	April 17-18....	200	1,000	Unknown.....	
Township 144-34....	April 19.....	80	100	Unknown.....	Yes.
Itasca County—					
Deer River.....	May 4.....	50	None	Clearing land.....	
Ray.....	May 12.....	3,000	200	Burning meadow...	Yes.
Township 56-22....	May 20.....	1,000	300	Unknown.....	Yes.
Township 54-22....	June 22.....	800	4,000	Unknown.....	
Township 55-22....	June 22.....	300	7,000	Hunters and land lookers.	
Township 63-24....	June 22.....	3,200	4,000	Camp fire.....	
Township 53-23....	May 10.....	3,000	800	R. R. locomotive...	
Township 53-22....	May 19.....	2,000	1,000	R. R. locomotive...	
Township 53-22....	April 16.....	80	160	Unknown.....	
Township 53-22....	June 16.....	300	200	Unknown.....	Yes.
Isanti County—					
Maple Ridge.....	April 19.....	500	500	Clearing land.....	
Kanabec County—					
Brunswick.....	May 18.....	400	None	Unknown.....	Yes.
Peake.....	May 2.....	200	1,800	Unknown.....	
South Fork.....	May 12.....	2,000	1,000	Burning meadow...	Yes.

SUMMARY OF FOREST FIRES, 1900—Continued.

COUNTY AND TOWN.	Date.	Acres.	Dam- age.	Cause.	Controlled by Fire Warden or Helper.
Lake County—					
Beaver Bay.....	May 1.....	100	1,200	Unknown.....	
Township 54-II.....	May 14.....	500	2,000	Unknown.....	
Marshall County—					
Eagle Point.....	June 24... ..	200	175	Unknown.....	Yes.
Nilson Park.....	April 20.....	1,000	100	Unknown.....	Yes.
West Valley.....	April 20.....	400	50	Unknown.....	Yes.
Wright.....	April 20.....	100	60	Unknown.....	Yes.
Morrison County—					
Buckman.....	June 25.....	60	50	Clearing land.....	Yes.
Clough.....	May 30.....	100	800	Clearing land.....	Yes.
Cushing.....	May 27.....	15	50	R. R. locomotive ...	Yes.
Cushing.....	May 28.....	200	500	Unknown.....	Yes.
Platte.....	June 24.....	500	50	Unknown.....	Yes.
Rail Prairie.....	May 16.....	5,000	None	Unknown.....	Yes.
Randall.....	May 30.....	400	800	Clearing land.....	Yes.
Randall.....	June 11.....	80	800	Burning brush.....	Yes.
Norman County—					
Wild Rice.....	May 6.....	600	500	Unknown.....	
Otter Tail County—					
Blowers.....	June 23.....	300	200	Unknown.....	
Oak Valley.....	May 10.....	15	10	Clearing land.....	
Pine County—					
Brook Park.....	June 27.....	200	250	Unknown.....	Yes.
Chengwatana.....	June 14.....	1,800	500	Unknown.....	Yes.
Dell Grove.....	June 18.....	60	40	Unknown.....	Yes.
Dell Grove.....	June 21.....	200	700	Burning old hay...	Yes.
Finlayson.....	June 20.....	300	300	Unknown.....	Yes.
Kettle River.....	June 25.....	80	25	Unknown.....	Yes.
Kroschel.....	May 18.....	50	500	Unknown.....	Yes.
Pokegama.....	June 10.....	1,300	4,730	Bee hunters.....	Yes.
Pokegama.....	June 12.....	1,200	3,260	Unknown.....	Yes.
Windemere.....	May 11.....	35	.....	Burning meadow...	Yes.
Windemere.....	June 18.....	200	.....	Clearing land.....	Yes.
Polk County—					
Bygland.....	April 20.....	2,000	1,500	Clearing land.....	Yes.
Bygland.....	April 20.....	1,000	2,000	Clearing land.....	Yes.
Rosebud.....	April 20.....	500	100	Unknown.....	
Roseau County—					
Grimstad.....	July 23.....	2,500	600	Unknown.....	Yes.
St. Louis County—					
Biwabik.....	May.....	500	200	Unknown.....	
Canosia.....	June 26.....	500	5,500	Campers.....	Yes.
Culver.....	June 25.....	900	300	Unknown.....	Yes.
Duluth.....	May 3.....	300	500	Unknown.....	
Duluth.....	May 30.....	300	500	Fishermen.....	Yes.
Floodwood.....	April 21.....	160	10	Clearing land.....	Yes.
Grand Lake.....	May 6.....	40	100	Clearing land.....	Yes.

SUMMARY OF FOREST FIRES, 1900—*Continued.*

COUNTY AND TOWN.	Date.	Acres.	Dam- age.	Cause.	Controlled by Fire Warden or Helper.
St. Louis Co.— <i>Cont.</i>					
Grand Lake.....	May 18.....	200	100	Unknown.....	Yes.
Grand Lake.....	May 20.....	1,000	200	Hunters.....	Yes.
Herman.....	May 24.....	15	20	Unknown.....	Yes.
Kelsey.....	June 16.....	2,000	3,000	Unknown.....	Yes.
Mesaba.....	May 13.....	10	None	Lightning.....	Yes.
Mesaba.....	May 24 and 28.	1,000	500	Unknown.....	Yes.
Stuntz.....	May-June.....	300	2,000	Unknown.....	Yes.
Township 57-21.....	June 28.....	700	3,000	Unknown.....	Yes.
Township 58-20.....	July 10.....	100	800	Unknown.....	Yes.
Township 59-21.....	July 15.....	80	3,000	Unknown.....	Yes.
Todd County—					
Eagle Valley.....	June 10.....	60	25	Hunters.....	Yes.
Eagle Valley.....	July 25.....	25	50	Clearing land.....	Yes.
Fawn Lake.....	April 20.....	200	100	Unknown.....	Yes.
Fawn Lake.....	May 4.....	300	100	Clearing land.....	Yes.
Fawn Lake.....	May 8.....	30	50	Unknown.....	Yes.
Moran.....	June 25.....	80	30	Unknown.....	Yes.
Wadena County—					
Rockwood.....	July 21.....	80	50	Unknown.....	Yes.

Total acres burned over, 179,521. Damage, \$153,399.

Per cent extinguished or controlled by fire wardens, 65.

Classification of causes:

Clearing land, 23.

Railroad locomotives, 9.

Campers and hunters, 13.

Burning meadows, 5.

River drivers, 2.

Other causes, 6.

Unknown, 81.

REPORTS OF FIRE WARDENS AND OTHERS OF FOREST FIRES IN 1900.

AITKIN COUNTY.

George Gardiner, town 51, range 27, May 7th:

April 30th-May 1st, at 10 a. m., a fire, from cause unknown, burned over forty to fifty acres of cut-over land in section 27. No damage. Two persons were called to help extinguish it, and it was whipped out with wet cloths in three hours after it started. Weather was very dry and windy.

A. H. Reed, chairman of the town of McGregor, July 5th:

On June 22d a fire burned over about 2,000 acres of mostly swamp, but did not destroy any green timber of note. Damage, \$200. Ten persons and four teams assisted in putting it out, by plowing and using wet sacks and backfiring. Weather dry and windy.

Same, July 8th:

On the 22d of June a fire burned over about 1,000 acres of mostly old pine cuttings, and destroyed small timber. Damage, \$220. Six persons were called to help extinguish the fire, and it is now all extinguished. The weather was windy and warm, and had been dry two months. There was rain June 30th.

L. Stenmark, chairman of the town of Farm Island, June 2d:

About noon, May 20th, a fire burned over 200 acres of cut-over pine land, and destroyed brush and small timber. It was extinguished in twenty-four hours after it started, with the help of eight persons, by raking around fire and clearing away all old timber and tops. Weather very dry and windy, and had been dry for nearly a month.

Axel Anderson, chairman of the town of Glen, June 26th:

On the 16th of June a fire burned over 320 acres of mixed heavy and small timber in section 12, being land occupied by L. L. Anderson. Damage, \$300. Cause unknown. It was extinguished in two hours, by the help of twenty persons, by carrying water and grubbing. Weather was windy, and had been dry for two and one-half months.

Same, July 17th:

June 21st a fire on section 29 burned over 100 acres of brush and timber. It was extinguished in nine days after it started, by the help of sixteen persons, by plowing and ditching along a road that runs east and west. Damage, \$100. Weather very dry and windy.

ANOKA COUNTY.

Gust Soderberg, chairman of the town of Ham Lake, June 19th:

May 1st a fire burned over 1,200 acres of heavy timber, destroying a small house and lumber for a new one. Damage, \$300. Supposed to have been set by locomotive of passenger train. Ten persons were called to help extinguish the fire, which was done by backfiring. It was impossible to face the fire, the wind being too high. Weather dry and windy, had been dry for one month.

BECKER COUNTY.

T. W. Chilton, chairman of the town of Burlington, July 25th:

April 25th fire burned over 400 acres of brush and light timber. Damage, \$300. Cause of fire unknown. Six persons were called and five helped to extinguish it, which was done by plowing around it and using water and wet sacks. Weather had been dry and windy for a month.



Boom of logs in Elbow Lake, White Earth Indian Reservation, cut under the "dead and down" law; but mostly from green and growing pine. Photographed, April, 1901, for the Annual Report of the Chief Fire Warden of Minnesota.

Albert Wothe, chairman of the town of Height of Land, May 21st:

May 6th a fire, caused by burning brush, burned over 6,000 acres of light timber, and destroyed timber and meadow. Damage, \$5,000. Twenty-six persons assisted in controlling it, which was done with hoes and shovels until rain came and helped put it out. Weather was dry and windy.

J. D. Hall, chairman of the town of Silver Leaf, May 29th:

About the 18th of May a fire burned over four sections brush and timber, and destroyed 100 cords of wood and 3,000 fence posts. Damage, \$600. Fifteen persons assisted in controlling it by all kinds of ways. Still burning, but no danger. Weather very dry and windy; has been dry all spring.

George I. Pratt, chairman of the town of Two Inlet, July 5th:

May 5th a fire burned over 700 acres of light timber, brush and meadow, destroying jack pine and small Norway. It might have started from a camp fire, or from someone burning hay meadow. Damage, \$100. Fire also started on section 6 in town south on the 15th, and ran across sections 31, 30, 19, 29, 20, and a part of 28 and 18. Fire also started in the southeast part of the town June 24th, on section 34, and ran across the south half of sections 28, 27, 35, 36 and 22. You might say the whole township is burned. Seven persons helped to control the fire. We could not stop the fire; all we could do was to save the settlers' property from burning. The weather was dry and windy; had been dry all spring. Some of the ground was burned over twice.

J. H. Sutherland, United States Indian Agent, White Earth, October 12th:

In compliance with your favor of the 2d instant, relative to forest fires in 1900, on the diminished White Earth Indian reservation, etc., I have the honor to respectfully state that, from the most reliable information obtainable, from timber cruisers, Indians and other persons, since writing you July 11th, who claim to have gone over the ground covered by the forest fire of last June, I have compiled the within inclosed map, showing the point near where the fire entered the reservation and the different courses it followed while it was raging. A large portion of the ground burned over was principally over old cuttings and sections over which previous fires had passed, as in the case of townships 141, 142, 143, range 39. In these towns, of course, while the fire burned fiercely, the greatest damage was done to the hard wood contained therein. From fair approximate figures there is contained in the diminished reservation from 75,000,000 to 100,000,000 feet of standing pine timber. From the most conservative sources of information it is estimated that the total amount of marketable pine timber scorched and burned during the forest fires of the past summer will not exceed 10,000,000 feet. As to the origin of the fire, I am unable to furnish any definite information. It is the supposition, however, that the fierce fires which burned in the vicinity of Cass Lake city and Bemidji traveled southwesterly a distance of some eighteen or twenty miles, and entered the reservation at a point indicated on the inclosed map of the reservation. As to the cause from which the fire originated, I am likewise unable to furnish anything definite. One theory is that, owing to the extreme hot and

dry state of the weather at that time, sparks from the locomotive ignited the dry leaves. Then, again, it is stated that the selfish proclivities of the so-called squawmen and "dead and down timber" lumbermen were the chief instigators, and instrumental in starting the fires; and then there is the ever-present theory that hunters or Indian campers are also blamable for the origin of the fire, etc.

BELTRAMI COUNTY.

P. O. Felt, chairman of the town of Bear Creek, April 25th:

April 21st there was a fire in the west half of township 145, range 46; also, on sections 35 and 36. Two fires also started in township 144, range 36. The weather has been dry and windy all spring.

Same, May 30th:

Very dry here, I see fire in the White Earth reservation and over in Hubbard county. Cannot say how the fires are set, but they are set on purpose, I am sure. I found lots of small spots in the woods where fires had been set and went out again.

Same, June 21st:

I have been out three days and have estimated the following six sections:

Section 16, burned very light; no damage except to young trees. Section 17, partially burned; no live trees burned, but windfalls are partly gone; damage about \$150. Section 21, no damage. Section 20, no damage except to young white pine. Section 30 and 31, badly burned, and the damage hard to estimate; big white pine and part dry; the damage on the two sections is about \$200. School section 36 is burned, the east half badly; all dry timber; lots burned down, and lots burned on the ground. It is very hard to estimate dry timber; if sound, it is easy, but being dry half the tree might be rotten. The damage will reach \$400. If I estimated young white and Norway pine ten years and under, the damage would be four times as much.

Knute Halvorson, chairman of the town of Bemidji, May 25th:

Yesterday a fire burned over 200 acres of jack pine land, and was caused from a camp fire where the river drivers had been making tea. It was extinguished by the help of six persons, by following a road with a backfire, and when we left the road we used shovels, and dug the sod off, and backfired in that way. Weather very dry and good breeze until evening.

Same, May 29th:

May 25th a fire burned over 100 acres of young timber, and destroyed perhaps half of it. Caused by another camp fire. It was extinguished in four hours after it started by the help of six persons, by plowing two furrows from the Mississippi river to Lake Irving, and whipping out the fire where it attempted to cross. Weather very windy.

Ole T. Hegland, chairman of the town of Frahn, July 20th:

Fires have occurred at intervals in my district, but I am glad to say that I have not heard of any damage done to anybody. Some sections of slashings cut last winter were burned early this spring, cause unknown, but as the timber had been

cut and the fire went through early in the spring no damage was done, and it seems to me that we are out of danger for this year. As I have opportunity to see the people, I am in the habit of carrying some paragraphs of the fire warden law, and read and explain to the people the danger of letting out fires.

S. P. Schreckengast, chairman of the town of Grant Valley,
May 18th:

On the 20th of April a fire burned over 15,000 acres, and destroyed brush and timber, two houses, cord wood and fences. Damage, \$15,000. Cause of fire unknown. It seemed to be a general fire. All the fire wardens and everyone else in town assisted in fighting the fire by backfiring, and about all the ways such a fire could be stopped. The weather was dry and windy. There had been practically no rain all spring, and very little snow throughout the winter.

Julius Strommer, chairman of the town of Holst, April 24th:

The settlers had been burning their hay meadows without doing any damage till the 20th instant. The weather was windy, and there had been no rain this spring, so the fire spread to some pine forest in the north part of the town; but how much damage was done it is impossible for me to state, as it has been burned over several times, some years ago. Cannot state who caused the fire. It originated from some hay meadows.

J. L. Wastweet, chairman of the town of Itasca, April 24th:

A fire, which originated on unoccupied land, on section 17, on the 20th instant, burned over 1,000 acres of light timber. Damage, \$150. Four persons assisted in putting it out. Weather very windy; had been dry all spring.

O. A. Thompson, chairman of the town of Leon, April 26th:

April 20th a fire, which originated in the adjoining town south, burned over fully one-half of the town of Leon, (149), range 37. Great damage to forest and personal property. The fire was extinguished in town 149, range 36, at about 9 o'clock p. m. the same day. I have been trying to find out the parties who set the fire, but cannot at present. Will make further investigations. There was a heavy southwest wind.

H. A. Fladhammer, chairman of the town of Liberty, April 26th:

On the 20th instant a fire, which came from the adjoining town south, burned over the south half of the town, and destroyed some pine and logs. Damage probably \$1,000. Cause unknown. Nearly everyone was out to help control the fire, some by backfiring. Weather dry and wind storm. It has been dry for six weeks. Each of the fire wardens were present. Louis Hanson crossed the lake when the waves threatened to run over him and the fire to melt him.

S. A. Tennyson, chairman of the town of Pine Lake, April
27th:

On the 20th instant a fire burned over 320 acres of light timber and pine, and destroyed \$600 worth of pine logs. It burned till it got to the road, and went out. It was caused by burning a firebreak around logs and letting the fire get away. The weather had been dry for two weeks, and there was quite a wind.

Alfred Lindgren, chairman of the town of Port Hope, April 23d:

I was through the south part of the town last Saturday (the 21st instant), and saw fires that were still in the edge of clearings and would run along on the dry leaves in the woods if not put out. It is getting pretty dry here now; not much snow last winter and no rain yet. There was considerable pine cut by the homesteaders in this town last winter.

A. R. Button, Bemidji, August 20th:

A fire in the unorganized township 147, range 32, May 21st to 23d, burned over 640 acres of medium timber, killing all small timber and considerable large timber. Damage, \$1,000. From all information I could obtain, the fire was caused by river drivers cooking tea with open camp fire. After I had extinguished the first fire I believe the same parties set a second fire, as the same started from another point on the Mississippi river. It was extinguished by beating it out with bushes and backfiring. The weather had been dry all spring.

John Clear of Langor, April 22d:

A very bad fire passed through sections 1, 12 and 13, town 150, range 32, on the 20th instant. The fire most of the way kept on the west side of O'Brien creek, where the timber had been cut last winter. The ground was covered with pine slashings, and with a strong south wind the fire ran like a race horse. For want of water the drivers have not started, and the Thief River Falls Lumber Company have a crew of men waiting for water to start driving. They had to work all day and night to save the logs from burning. Had it been a month later they would have lost seven or eight million feet of logs. I am glad that the fire has gone through the slashings for the ground is wet, and the fire has not injured standing pine much. I was through town 151, range 32, yesterday warning the settlers against letting fire into their slashings. If we do not have rain soon we are in danger of having everything in this section of country burned up. I never knew fire to run during the month of April before, and I have lived here twelve years.

Same, June 25th:

A fire started yesterday in section 2 in slashings that had been partly burned over last April. I cannot account for the fire unless it has been smoldering in the ground ever since. A high wind blowing at the time drove it into the Thief River Falls Lumber Company's camp, and in spite of all that we could do, it destroyed all their barns and blacksmith shop and other buildings. We fought the fire at the risk of our lives, and saved the logging camps and office. There were but four of us. The fire also caught in some rollings of logs that had not been put in the creek, and burned about 300,000 feet of them. Loss in all about \$3,000. No rain to settle the dust so far this year. If it keeps dry we will all have to leave this country or be burned up.

Charles Fleischman, Ralph, April 24th:

If we do not have rain soon it will be very dangerous with fire. There is a fire in some place nearly every day. Last week (Friday, April 20th) there was a big fire down in town 147, range 32. It has burned over a large country, spoiling a large amount of timber. I was down the Sunday after; did not dare to be out of our town 148, range 32, on account of fires being here. A. R. Botton and two men were out two days last week, fighting fire in town 147, range 32. We have had no rain all spring.

Same, May 16th:

On the 10th, 11th and 12th of May a fire in the southern part of the town of Port Hope (township 148, range 32), burned over a large part of sections 29, 30, 31 and 32, and destroyed a good deal of young pine. It may have destroyed quite an amount of large pine. The fire was on section 5 of the town immediately south when I found it and had been burning in that town quite a number of days. Where and how it originated I do not know. Myself and two men were setting backfires and trying to extinguish it, but it was useless. The wind and awfully dry weather were against us. It was extinguished by a rainfall on the 13th instant. On May 13th was the first rain of any account. It has been raining and wet up to the present date.

Same, August 17th:

During the drought there were quite a number of fires started in this township (148, range 32), the largest being on section 33. The fire started in the town south. Did not do much damage to large pine, but deadened all small trees. Where timber stood thick it has deadened larger trees also. The fire was brought to a stop on section 32 by counterfire and fighting morning and evening. Damage to large timber about \$100; to small pine considerable. Fire on section 9 was set by a homesteader burning brush, but it was got under control after fighting for about six hours. This country would have been in great danger if the fire warden service were not in effect.

Alex. Maule, Tenstrike, June 26th:

May 27th I discovered a fire in town 148, range 30, which burned over part of sections 4, 10 and 11. Damage, several hundred dollars. It was probably caused by cruisers, or persons traveling through the country. Rain commenced about four o'clock, and continued all night, and put out the fire.

Edward Gallagher, chairman of the town of Moose Creek,
April 23d:

April 20th a fire came in on us from the White Earth Indian Reservation, and was put out after some hard work. The only damage done was the loss of a ton of hay. On the 22d a fire started on section 34, in old slashings. It was put out without doing any damage. It is awfully dry, as we have had no rain this spring, and there is fire all around us, and if we do not get some rain I think we will have some bad fires in this part of the country.

Same, May 13th:

A fire was started on section 28, by burning brush, and it could not be stopped. It spread on old slashings, and we thought it would be a bad fire, as everything was so dry, but we got a shower of rain at 4 p. m., and I think it will put out all fires in this township. The fire did no damage, but as this part of the country was cut over last winter, and finished up, we have got to be careful in dry times, and the people as a general rule are careful.

Same, August 8th:

On the 4th instant a fire started on section 12 in old slashings, and it looked bad for a while, but the next day a heavy rain set in and put it out, so it did no damage.

Adolf F. Johanson, Alida, May 1st:

April 10th a fire burned over 160 acres of brush and meadow. It was extinguished by myself by backfiring.

Same, April 24th:

On the 16th of April a fire burned over 680 acres of brush and light timber. Damage, \$500. The weather was dry and windy. Swamps checked the progress of the fire.

Same, May 8th:

On the 4th instant a fire in town 145, range 36, burned over 160 acres of timber and brush. Damage, \$100. It was controlled by backfiring.

Same, May 19th:

May 10th a fire on sections 23, 24, 25, 26 and 27, town 145, range 37, burned over 1,280 acres, and destroyed about 200,000 feet of pine logs, and impaired 500,000 feet of green pine which should be cut this winter. Damage, \$2,500.

Same, June 1st:

May 23d a fire in township 145, range 37, burned over 4,000 acres of brush, heavy and light timber. Damage, \$5,000. Rain and work done by me stopped the fire.

Michael Kelly, Nibish, June 1st:

April 20th a fire in the middle of township 150, range 33, burned over 3,000 acres of mostly cut-over land, destroying 300,000 feet of logs at landing and 50,000 on skids in the woods. Damage, \$3,500. Cause, sparks from a locomotive. The fire also killed 1,500,000 feet of standing pine, which can be mostly saved by cutting this fall. By hard work, with 100 men, we saved several million feet of logs. Since then we had fire get into the logs twice, but put it out without loss. This also burned seventy-five cords of wood. It was extinguished by backfiring at night, and clearing away, and heading the fire off at night, and last, but not least, a shower of rain. The weather had been dry two months, and the wind was blowing a gale from the south. This fire burned several million feet of pine on the reservation, along the railroad track. If not cut this winter it will be a total loss. In the east part of township 150, ranges 34 and 35, a fire burned over 4,000 acres, and destroyed pine on sections 19, 23 and 24, in township 150, range 34. Damage, \$2,000. This town was burned over about the middle of April, but not much damage done to standing timber, only one day, Friday, April 20th, it killed the timber wherever it burned.

Thomas Joy, Bemidji, May 1st:

On the 5th, 6th, 7th and 8th instant, a fire burned over all of sections 13, 14, 15 and 11, of township 147, range 33, and did damage to the pine timber to the amount of \$2,000. Could not find where the blame should be laid. A crew of men worked night and day for three days and nights, with wet sacks, pails of water and backfiring. Weather very windy, and had been dry since snow went, except for one short shower.



Food for forest fires. Sample of country on the White Earth Chippewa Indian Reservation where the United States Government lumbered for the Indians a few years ago in a splendid forest of Norway pine. Shows a lack of forestry methods. Photographed, April, 1901, for the Annual Report of the Chief Fire Warden of Minnesota.



Private forest of spruce and fir in Germany. Light cutting just made of largest trees. A "selection forest," in which the large trees are cut and the smaller ones left to grow. Engraved for the Annual Report of the Chief Fire Warden of Minnesota.

BENTON COUNTY.

Jens P. Anderson, chairman of the town of Glendorado, April 28th:

On the 19th of April a fire burned over forty acres of meadow, and destroyed twenty tons of hay. Damage, \$40.

CARLTON COUNTY.

Matt Seppanen, chairman of the town of Kalevala, July 6th:

On the 26th of June a fire, originating in the county of Aitkin, burned over a portion of three sections. Nineteen persons assisted in extinguishing it, by digging ditches; then rain came to assist. Weather was dry and windy. It has been dry all summer up to June 30th.

Same, July 16th:

On the 29th of June a fire went through four sections, and burned over 1,300 acres of brush and small timber, destroying 300 railroad ties and eight pine saw logs. Damage \$105. It came from Aitkin county, and was stopped against the road by backfiring.

Christ E. Larson, chairman of the town of Mahtowa, July 4th:

I have to state that two fires were set, I may say under my personal observation, on the 26th ultimo, by the St. Paul & Duluth trains. It so happened I was working on the county road, with Eric Benson. In the afternoon a train set fire to the grass on the county road, which we finally put out; and after going to Gust Selgren's, about a mile away, for water, and got back, another fire was set a short distance from the other, which we put out, without any damage being done.

Same, July 6th:

On the 27th of June a fire in section 4, town 48, range 19, caused by sparks from a Northern Pacific railroad freight train going east, burned over 400 acres of bog swamp, and destroyed a railroad bridge, 700 feet in length.

W. Wesley, chairman of the town of Moose Lake, July 2d:

About noon on the 22d of June a fire occurred mostly on section 36, town 46, range 20, and burned over 400 acres of partly light and partly heavy timber, but from which the pine had been previously cut. It was certainly set intentionally, as it started in three different places at the same time. The guilty party not known. It started about a mile from any house. It was mostly extinguished in eight and one-half hours with the help of about sixty persons, but had to be watched several days. We cut a road, ditched several miles and backfired. All the fire wardens were present. Reliefs were at work day and night. The weather was dry and windy. We have had no rain here this season. The men did remarkably hard work in controlling and extinguishing the fire, and the weather was extremely hot. There is a thick growth of timber from the locality of the fire extending north a mile and a half to the public road, on which there are a number of cleared farms. Had not the fire been controlled some of these farm buildings would have been exposed, and the fire might have also extended to the

village of Barnum. From the place of the fire the same sort of forest also continues without break, except one or two narrow roads, easterly to the village of Moose Lake, a distance of two and one-half miles in a direct line. During the fire there was a strong wind most of the time from the southwest.

CASS COUNTY.

P. H. Wall, President Village Council of Cass Lake, April 22. [Telegram]:

We have town surrounded with men guarding forest fire. Think town safe.

COOK COUNTY.

H. Mayhew, chairman of the town of Grand Marais, May 17th:

On the 10th instant a fire occurred in the town of Maple Hill (section 4, town 61, range 1 east), which extended west from Headstrom's some two miles and north one mile. The fire wardens of Grand Marais town worked with men four days and nights to stop its spreading from Maple Hill to this town.

HUBBARD COUNTY.

Andrew Svenson, chairman of the town of Helga, Feb. 21st, 1901:

I did not become chairman of this town before the first of June. Our first election was May 21st. On the 20th of May a fire destroyed the village of Nary, in this township, doing damage to the amount of \$22,000. [Note.—In a subsequent report Mr. Svenson states that his estimate may have been a little high. The postmaster at Nary had previously estimated the damage at \$12,000.] The fire appeared to have originated by burning brush on a homestead. About twenty men assisted in extinguishing the fire, and a mill was saved. On the property destroyed in the village there was insurance to the amount of \$5,000. [Note.—Ole J. Farden, fire warden of this township before its organization, resigned April 15, only a short time before this fire.]

Lon Dutton, chairman of the town of Lake Emma, May 5th:

May 1st a fire burned over about one section, being old choppings, and was caused by campers, as near as I can ascertain. It was extinguished by backfires and heading it off along old trails. The weather was very dry and windy on that day. We had a shower about four days previous to the fire. If it had not been for our efforts we would have lost our schoolhouse and a neighbor his buildings.

KANABEC COUNTY.

H. R. Parks, chairman of the town of South Fork, May 2d:

On the 12th of May a fire burned over 2,000 acres of mostly hard maple, and did damage to the amount of \$1,000. It was caused by clearing meadows of old grass. The swamp is seven miles long, and holds fire most of the summer when the weather is dry. Nine persons were called to help extinguish it, which was done in two days after it started, by backfiring along logging roads. The only fire warden present was myself. The weather was dry and windy.

LAKE COUNTY.

Jacob Hangartner, Jr., chairman of the town of Beaver Bay,
May 5th:

On the 1st instant a fire burned over 100 acres of light timber, and destroyed 4,000 ties. Damage, \$1,200.

John Runquist, chairman of the town of Two Harbors, April
30th:

I made a trip to the scene of the fire, made a personal examination, and obtained as much information as possible, which is as follows: There are two log landings near Silver creek, one on each side of the river, about one-quarter of a mile apart. The landing on the north side of river had about 5,000,000 feet of logs, and the other about 6,000,000. Just before noon on Thursday, the 26th instant, the watchmen noticed that a small brush shanty (built of brush merely) near the north landing was burning, and, taking some water, thought they had the fire put out. They went to the far end of this landing to look for any more fire, and on returning saw the fire had again started, and was burning in among the logs. The watchmen could do nothing with the fire, and in less than an hour the fire was carried to the south landing. There was a very strong northeast wind blowing, and the flames spread rapidly. The entire 6,000,000 feet of logs on the south landing were consumed and about 2,000,000 feet on the north landing, a total loss of 8,000,000 feet, valued at \$75,000. About the origin of the fire little is known, but the presumption is that two men, who were seen in that vicinity earlier in the day, stopped at this small brush shanty, and built a fire and had lunch, and then left without extinguishing the fire, and the ground being very dry, the fire spread rapidly. I examined the woods around that locality yesterday, and found that all fires had been extinguished; no sign of any smoke anywhere near. There seems to be no further danger.

Same, May 19th.

The fire did not start in the woods, but right at the shanty, and did not burn back in the woods from shanty, but directly towards the logs and lake. The country was not burned over at all,—only from shanty to lake. The distance from the shanty to logs on north side of river was about 200 feet. The timber in the neighborhood of logs is mostly balsam and hazel underbrush,—the underbrush quite thick.

Thomas Owens, Superintendent Duluth & Iron Range Ry. Co.,
Two Harbors, May 21st:

We have made special effort this spring, on account of the dryness of the season, to use great care in regard to setting fires, etc., also, have issued special instructions to our men, calling attention to section 12 of your Circular No. 1, as well as other sections which apply to this subject. I have received a large number of reports from our men of fires existing in different sections along the line, and a number of instances where they have been successful in putting them out. There are a number of shippers of timber along our road, many of whom are not yet done with their seasons shipments; therefore there are places along the right of way which cannot be properly cleared up, but parties owning such timber have

watchmen at such places for their own protection. On account of the briskness of the times, there are a large number of land lookers and prospectors throughout this territory, and there is no doubt but what a large number of fires have been started by such people, although unintentional on their part.

PINE COUNTY.

G. C. Tallman, chairman of the town of Chengwatana, July 7th:

On the 14th of June a fire burned over three sections of brush and light timber, and destroyed green timber. Damage, \$500. Fire continued from June 14th to June 30th. We were unable to extinguish it until it rained, June 30th, owing to the extreme dry weather, it having been dry since early in the spring. We did not dare to leave it until the rain came. It was necessary to call on a large number of persons to help extinguish the fire, and to keep watch when it broke out anew.

E. C. Getchell, chairman of the town of Kettle River, May 10th:

Today I went to a fire that was burning on the northwest quarter of section 29, town 44, range 20. The timber had been all cut off some years ago, and I succeeded in keeping the fire out of some green white pine on the northeast quarter of section 30. Cannot say what was the cause of the fire.

P. H. Andersen, supervisor and fire warden of the town of Pokegama, July 14th:

On the 10th of June a fire originated on section 7, and burned over 1,300 acres of meadow and light timber. Damage, \$4,730. It is reported that three men from the adjoining town of Brook Park cut a bee tree, and set fire to smother the bees, and the fire commenced to run, and they let it run; but no witness can be had of the fact. Thirty-nine persons were called to help extinguish it, which was done by clearing and plowing, hauling water with tank and filling a line of barrels, ditching, raking and using wet sacks, making old roads the fighting line,—fighting the fire by day and watching it by nights. Weather extremely dry and windy, and very warm. Several persons did especially praiseworthy work. A saw mill was near the fire line, and was saved by hard and continuous fighting.

On the 12th of June a fire, which originated on section 11, burned over about 1,200 acres of light timber, brush and meadow, and destroyed timber, two barns and numerous fences. Damage, \$3,260. Cause of fire unknown. Thirty persons were called to help extinguish the fire, by clearing and plowing, and working as above stated in respect to the other fire. A number of farm houses were threatened, but by hard and continuous fighting the buildings were saved. This and all other fires were finally extinguished by the heavy rains that fell during the night between June 30th and July 1st.

Robert Derr, chairman or the town of Pokegama, July 14th:

I have done my best to find evidence that would convict them (parties supposed to have set the fire), but as yet I have found nothing that would be considered good evidence, as no one seems to have seen anyone set fire. I was not at the fire at the time it was burning, but have looked the situation over since then, and I think Mr. Anderson did all he could in the way of managing the work. I have had him sign his name to the reports, as he was the one that managed and conducted

the work. The bill will amount to considerable, as we had so many men to work; but the men are not charging for half the time they put in, and I am afraid if their pay should be refused them this time it would be hard work to get a crew to fight fire again if we should have another one to fight.

The Pine Poker, July 19th:

Our town has suffered greatly of late from forest fires, which got started during the dry season. Nearly 31,000 acres were burnt over, destroying timber of all kinds, burning the soil, and the grass on the meadows to the extent of about 100 tons of hay, and many of our people are guessing where they will put up hay enough to winter their stock. Had it not been for the determined effort of our people, under the management of our fire wardens, the entire country west of Pokegama lake and river to the Kanabec county line would have been burnt over; but by the praiseworthy course taken to extinguish the flames the victory was finally gained. Some fifty to sixty persons were working, some during the night as well as daytime, to save their property. Only two barn buildings were burnt, one belonging to Mr. Brown, on section 14, on the west shore road, but we saved the house, although the fire was within seven or eight feet only from the walls. The other barn was J. E. Nostrom's place, west of the river. The entire country between the west shore road and the new railroad was saved, and about three and one-half miles east and west by six miles north and south, about twenty sections of land, that would also have been scorched had it not been for the commendable care taken.

ST. LOUIS COUNTY.

H. H. Salmon, chairman of the town of Biwabik, July 7th:

The fire in this town which I reported June 27th burned over a great many acres of mostly slashings, but from what I can observe no valuable timber was destroyed. The timber which was destroyed was balsam, tamarack and birch, and sparsely timbered at that. I did not consider the fire dangerous.

William C. McCrimmon, chairman of the town of Canosia, June 28th:

On the 26th of June a fire, which originated on section 18, burned over 500 acres, destroyed logs and timber, and did damage to the amount of \$5,500. It was extinguished by water and clearing away rubbish and smothering it out with shovels and dirt. If the fire had not been stopped it would have burned out two saw mills. It is supposed to have been caused by the neglect of lumbermen's employes to put out a fire where they had been cooking.

N. A. Barnes, chairman of the town of Duluth, May 6th:

On the 3d instant a fire on section 36 burned over 300 acres of cut-over lands. Damage to ties, posts and logs, \$500. The fire was held in check by twenty-five employes of Smith & Alger's Lumber Company. There are in the town of Duluth at least 15,000 acres of cut-over lands that have never been burned over. The weather is very dry, and if it continues so, and fire starts, there will be a great loss of property, if not of life. Some of the settlers have lands they wish to clear, and have asked me how and when they can burn them. Please instruct me on this.

J. W. Kreitter, Superintendent Duluth, Missaba & Northern Ry. Co., April 21st. [Telegram]:

Quite a few forest fires along and adjacent our road.

Same, May 17th.

The bulk of the fires in this section of the country, I think, can be traced to people trying to clean up their brush at a time when it is dangerous, as it has been this spring, and when you speak of having come across a few small fires on your trip, I would like to tell you of a few large ones that we have had. For instance, on Monday, April 30th, a fire swept across some choppings in the neighborhood of section 6, township 50, north, of range 16 west, fourth principal meridian, and in his fire our company lost 3,805 new ties. Parties by the name of Murray & Gilmore lost about 200 telegraph poles and several thousand posts, while a man by name of Hanson, in same location, lost 800 fence posts. This was all done in one fire. I expect to send you in a day or two copies of statements that I took in this case, so that you will be able to take any action that you wish. We also lost in this same fire about twenty rails which were warped out of shape on account of the heat of the fire. Another fire that we had last Sunday, on the 13th, we lost between 4,000 and 5,000 ties, the Northern Lumber Company lost 225, and Paul Mattson lost 800 fence posts. The fire also destroyed our telegraph wire and poles for about 800 feet. How this fire on Sunday caught, I do not know, as I have not yet investigated the matter.

John Peterson, chairman of the town of Grand Lake, May 8th:

On the 6th of May a fire on section 23, caused by clearing land, burned over forty acres, and destroyed a stable and hay barn belonging to a farmer. There is still fire in several places in the woods, and the air is full of smoke all over. The weather is dry.

NOTE.—The party causing this fire was fined twenty dollars and costs, in all \$22.50 in the municipal court of Duluth.

Wesley Mathews, chairman of the town of Kelsey, June 21st:

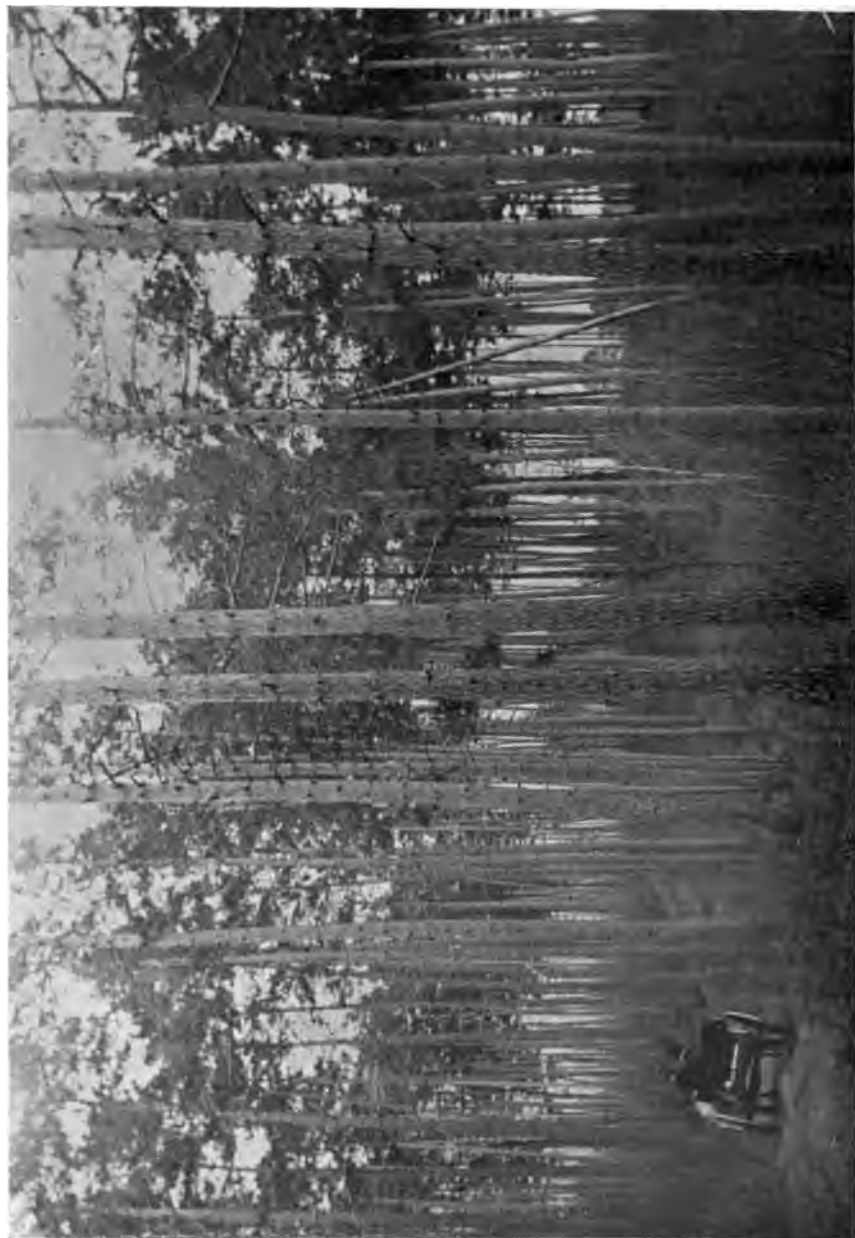
On the 16th instant a fire on section 27 burned over hundreds of acres of brush, heavy and light timber land. Damage, \$3,000. The supposition is that it was set by a locomotive. There has been no rain this spring or summer.

Same, June 23d. [Telegram]:

Have large force now on White Face (river). Will increase it. Large quantity of logs caught fire yesterday despite all efforts to prevent.

John Lake, chairman of the town of Mesaba, July 17th:

I go all over the town whenever I think it necessary. We have had very little fire in this town, while other towns adjoining have had more or less fires; but our section crew has done nicely, and been on hand to stop all railroad fires, and put them out promptly. I have prevented several fires by being on hand to warn parties of the danger of fires, mostly miners. At present everything is doing nicely.



Forest of Norway pine, on undulating surface, on the White Earth Indian Reservation. A "selection" forest. Photographed, April, 1901, for the Annual Report of the Chief Fire Warden of Minnesota.

J. H. Hearing, chairman of the town of Mesaba Mt., June 20th:

I am in receipt of your favor of the 19th, and also of your message of the same date, and in reply would state that I went to Virginia and the vicinity, and looked over the ground as far as it concerned the town of Mesaba Mt., of which board I am the chairman. The fire of which you were notified was in the swamps near the town, and as the city is a separate corporation from the town of Mesaba Mount, I considered that my duties did not cover that territory. I went also at that time to the Auburn mine, where a fire had started, and had an interview with the superintendent of that mine regarding the same, offering to place men there should there be any necessity for the same, at which time he said there was no need.

Same, August 14th:

The fires in the vicinity of Sparta have been no more excessive or dangerous than they have been in all the other towns in this township, I judge that as the Duluth & Iron Range Railway and the Duluth, Missabe & Northern Railway both have tracks running through this place, and also from the fact that the Duluth & Iron Range Railway is doing a great deal of switching at the Genoa and the Sparta mines, that many of the fires in that vicinity occur from the sparks of the locomotives. It is simply an impossibility to prevent the spread of fires in as dry a time as we have been having. There has been no call on me as fire warden, nor on Mr. Sullivan, local fire warden at Sparta, for any assistance from the fire warden's department, Had there been, either Mr. Sullivan or myself would have furnished it. It would require a very large and extensive force to prevent the spread of fires in this township, owing to the fact that the major portion of the white pine has been cut and the slashings are now very dry. The best thing that could occur would be that the fires burn off the tops and down timber, as there is no other remedy for preventing the fire spreading.

TODD COUNTY.

D. B. McDonell, chairman of the town of Fawn Lake, May 12th:

On the 4th instant a fire burned over 300 acres of pine slashings and timber, and destroyed about eighty acres of tall and thrifty young jack pines. Damage, \$100. It was caused by setting fire to the dead grass on the creek bottom land. A great many chicken nests were burned. The weather was dry, hot and windy. It is a very hard matter to guard against fire around here, as there are thousands of acres of vacant land. I live six miles south of the Long Prairie river, and there is only one farmer between me and the river, on the road to Motley.

SUMMARY OF PRAIRIE FIRES, 1900.

COUNTY AND TOWN.	Date.	Acres.	Dam- age.	Cause.	Controlled by Fire Warden or Helper.
Clay County—					
Barnesville.....	May 5.....	160	50	Unknown.....	
Cromwell.....	May 6.....	10	5	Unknown.....	
Flowing.....	April 19.....	200	31	Unknown.....	Yes.
Hagen.....	April 19.....	160	.....	Burning stubble....	Yes.
Hawley.....	May 6.....	600	200	Unknown.....	Yes.
Reverton.....	April 8.....	300	10	Unknown.....	Yes.
Spring Prairie.....	May 5.....	1,000	200	Unknown.....	
Kittson County—					
Deerwood.....	April 10.....	2,000	.....	Burning grass.....	Yes.
Deerwood.....	April 20.....	2,000	3,900	Burning grass.....	Yes.
Deerwood.....	May 17.....	700	250	Boys with matches..	Yes.
Houlton.....	April 20.....	5,440	500	Unknown.....	Yes.
Township 161-46....	April 18.....	5,000	350	Unknown.....	
Richardsville.....	April 19.....	700	50	Unknown.....	Yes.
Spring Brook.....	April 20.....	1,000	60	Burning grass.....	Yes.
*Township 160-46. etc.	April 20.....	160000	47,050	.....	
Teien.....	May 21.....	40	300	Clearing land.....	Yes.
Lac qui Parle County—					
Freeland.....	May 1.....	300	.....	Unknown.....	
Manfred.....	April 5.....	50	187	Unknown.....	Yes.
Marshall County—					
Bloomer.....	May 12.....	200	1,100	Unknown.....	Yes.
Comstock.....	April 14.....	400	24	Unknown.....	Yes.
East Valley.....	April 20.....	40	7	Hunters.....	
Foldahl.....	April 20.....	2,240	150	Unknown.....	Yes.
Grand Plain.....	July 26.....	1,000	2,500	Burning fire-break..	Yes.
Lincoln.....	May 4.....	1,000	25	Unknown.....	Yes.
Roller.....	July 29.....	4,000	1,000	Unknown.....	Yes.
Spruce Valley.....	April 2.....	80	150	Burning brush.....	Yes.
Thief Lake.....	July 25.....	1,500	200	Hunters.....	Yes.
Township 155-39....	July 24.....	2,000	500	Unknown.....	Yes.
Norman County—					
Green Meadow.....	May 11.....	500	200	Burning meadow....	Yes.
Hagner.....	April 19.....	1,280	100	Burning grass.....	
Otter Tail County—					
Carlisle.....	April 20.....	600	75	R. R. locomotive....	Yes.
Girard.....	April 27.....	500	25	Burning grass.....	
Stevens County—					
Everglade.....	July 1.....	50	100	Lightning.....	Yes.
Polk County—					
Chester.....	May 4.....	3,000	500	Burning grass.....	
Eden.....	April 20.....	1,200	300	Clearing land.....	Yes.
Kertsonville.....	April 12.....	400	50	Unknown.....	Yes.
Red Lake County—					
Black River.....	April 12.....	1,000	50	Unknown.....	Yes.
Equality.....	April 19.....	80	None.	Unknown.....	

* O. J. Anderson, Sheriff of Kittson County, estimates area burned over by the fire of April 20, at 160,000 acres, and the damage \$47,050.

SUMMARY OF PRAIRIE FIRES, 1900—*Continued.*

COUNTY AND TOWN.	Date.	Acres.	Dam- age.	Cause.	Controlled by Fire Warden or Helper.
Roseau County—					
Dewey	July 25.....	500	50	Smoking.....	
Lind	July 30.....	2,000	500	Unknown.....	Yes.
Malung	April 15.....	3,000	400	Unknown.....	
Soler.....	July 25.....	1,500	800	Unknown.....	Yes.
Township 162-37, 38.	May 2.....	800	365	Unknown.....	Yes.
Swift County—					
Six Mile Grove....	Nov. 9.....	400	441	R. R. locomotive....	Yes.
Todd County—					
Fawn Lake.....	April 30.....	200	25	Burning meadow...	
Fawn Lake.....	April 20.....	150	15	.....	
Fawn Lake.....	April 21.....	80	Slight	.....	
Wilkin County—					
Barnesville	May 13.....	700	15	Unknown.....	
Manston.....	Nov. 3.....	1,600	100	Burning break.....	
Yellow Medicine Co—					
Florida.....	April 18.....	220	50	Burning grass.....	
Florida.....	April 19.....	300	.....	Unknown.....	Yes.
Florida.....	Oct. 18.....	320	100	Unknown.....	Yes.
Florida.....	Oct. 19.....	500	110	Threshing engine...	
Florida.....	Oct. 20.....	140	30	R. R. locomotive...	
Fortier	Oct. 18.....	600	300	Burning straw.....	

Total acres burned over, 213,240. Damage \$63,017.

Per cent extinguished or controlled by fire wardens, 57.

Classification of causes:

Burning grass, straw or stubble, 15.

Railroad locomotives, 3.

Other causes, 6.

Unknown, 26.

REPORTS OF FIRE WARDENS OF PRAIRIE FIRES IN 1900.

CLAY COUNTY.

William Perkins, chairman of the town of Cromwell, May 9th:

A prairie fire the 6th instant burned over ten acres, and would have endangered two farm premises if it had not been controlled.

S. O. Holte, chairman of the town of Hagen, April 30th:

On the 19th of April a prairie fire burned over 160 acres, and was caused by burning grass. It endangered farm buildings. The party who caused it was taken before a justice of the peace, and fined five dollars and costs.

KITTSOON COUNTY.

C. G. Lindahl, chairman of the town of Deerwood, April 23d:

On the 20th instant a fire, which originated on section 36, burned over 2,000 acres, and did damage to the amount of \$3,900. Fifty-seven persons assisted in controlling the fire. Weather very dry and very windy, and had been so for several weeks. The person who caused the fire was fined twenty-five dollars and costs amounting to \$13.63.

Same, April 27th:

April 10th a fire, which originated on section 2, burned over 2,000 acres. The party who caused the fire was fined twenty-five dollars and \$6.33 costs.

John Kjellberg, chairman of the town of Hazelton, April 24th:

On the 20th of April a fire, which came from the town south of Hazelton, burned over 5,440 acres of brush and prairie. Damage, \$500. The number of persons assisting in extinguishing the fire was twenty-one. The country burned over in our town is light and heavy brush, with patches of prairie here and there. There has been no rain here for six weeks, and on the 20th there was an extremely high wind. Every man did his best, but we could not do anything on Friday or Saturday towards putting the fire out, only try to save the buildings; but on Sunday and Monday we began to get the better of it, and on Monday extinguished it altogether.

C. E. Braathen, Beaton, April 22d:

On the 20th of April, in the forenoon, a fire went through the west side of Deerwood and of town 160, range 46, and how far north I cannot tell. There was a very heavy storm from the southwest, and the fire went faster than a horse could go. It burned over all kinds of land and destroyed timber, dwelling houses, barns, granaries, grain, horses and some other stock, and did damage to the amount of many thousands of dollars. All people were busy trying to save their own property, but they could not do much because the fire went too fast. The ground was very dry, because there has been no rain here this spring. I had to go through the fire to come home and save my property. I got horses and plow and plowed a strip one and a half mile long, and with the help of another person saved my home and over half a section of timber land, and we got the fire extinguished on the east side about nine o'clock in the evening.

C. J. Anderson, sheriff of Kittson county, Hallock, May 1st:

I herewith send you a report of the fire of April 20th, which started in the southeast corner of section 31, town of Deerwood, supposed to have been caused by burning brush on the edge of the field. The amount of damage as obtained from the property owners themselves (the aggregate of damage to individuals) thus amounts to \$11,850. There is also about \$35,000 worth of growing timber that was destroyed by this fire. The space this fire went over is twenty-five miles long and ten miles wide. The fire was extinguished on the night of April 23d,

MARSHALL COUNTY.

Amund Johnson, chairman of the town of Foldahl, April 25th:

On the 20th of April a fire burned over 2,240 acres of prairie, brush and light timber, and did damage to the amount of \$150. It came from section 1, in town

of McCrae (155, range 47) then over to the southeast corner of section 36 in town of Alma (156, range 47) then over section 30 in town of Foldahl. It was extinguished by whipping, by breaking, and by backfiring near the road. Weather dry, and strong south wind.

INSTRUCTIONS TO FIRE WARDENS.

The following circular, which has been sent to every fire warden this year, is similar to the instructions which have been sent to them in each of the preceding years, together with a supply of fire report and other blanks and with stamped return envelopes:

C. C. ANDREWS,
Chief Fire Warden.

R. C. DUNN (State Auditor),
Forest Commissioner.

CIRCULAR
No. 16. }

STATE OF MINNESOTA,
OFFICE OF CHIEF FIRE WARDEN,
ST. PAUL, MINN., April 9, 1901.

TO FIRE WARDENS:

People with capital will not be likely to make dairy and stock farms in your towns if their hay and other property are to be endangered by forest and prairie fires caused by someone's carelessness.

We are entering upon the seventh year of the Fire Warden Law, and each year should show improvement in its administration. The great object of the Fire Warden Law is to *prevent* the careless setting of forest and prairie fires. The law assumes that town supervisors are in position best to attend to this. They pass through their towns on public business, they know who is most likely to be careless, and they have the authority, influence and opportunity for warning careless persons better than almost anyone else. It was because of this that they are constituted Fire Wardens. They must anticipate dangerous weather and by timely efforts guard against any fires that might prove unmanageable. It is impossible by human agency to extinguish a great forest fire, but such fires can be prevented. Take a pride in making a good record for yourself and your town in preventing dangerous fires.

Under the Fire Warden Law of April 18, 1895,

Supervisors of towns are Fire Wardens.

Mayors of cities are Fire Wardens.

Presidents of village councils are Fire Wardens.

Fire Wardens shall post, or cause to be posted, warning placards. Not exceeding \$4 in all should be charged for posting placards in any one township in any one year.

Fire Wardens shall take precautions to prevent the setting of forest and prairie fires.

Fire Wardens shall enforce the provisions of the law.

This means that, among other things, they shall make complaint against parties who violate the law, and endeavor to have them punished. Circumstantial evidence is sometimes sufficient to convict. A person who in very dangerous weather causes a fire which endangers the property of another is liable under the first part of section 9.

Chairmen shall inquire into the cause of each forest or prairie fire within their districts and shall report the same, etc.

This means that they shall make a prompt and thorough inquiry, and *prompt report* to the Chief Fire Warden.

The Chief Fire Warden has general charge of the Fire Warden force of the State, consequently his reasonable orders and instructions are to be obeyed with promptitude.

Any Fire Warden who refuses or neglects to perform his duties shall be deemed guilty of a misdemeanor, and shall upon conviction thereof be punished by a fine of not more than \$100 or imprisonment in the county jail not to exceed three months.

District courts as well as justices of the peace have jurisdiction of offenses under the Fire Warden Law.

In case a Fire Warden is to be absent even for only half a day, he should arrange to have someone act in his place.

Each chairman will furnish one of the printed copies herewith of this circular to each of the other supervisors of his town.

If county commissioners fail to allow your reasonable **accounts** you can appeal to the district court.

Fire Wardens will please read and preserve this and other printed instructions which they may receive, and turn the same over to their successors.

Respectfully,

C. C. ANDREWS,

Chief Fire Warden.



Remains from recent logging of green and growing pine under the "dead and down" timber law, on south shore of Cass Lake. Green stumps visible. Photographed, September, 1900, for the Annual Report of the Chief Fire Warden of

DUTIES OF RAILROAD COMPANIES.

The following circular which has been sent to railroad companies this season is substantially the same as has been sent to them in previous years together with an equal number of cloth placards for posting at stations. It is very important that railroad companies keep their right of way clear of all combustible material and that they promptly send out their section men to extinguish any fire that may be discovered along their lines:

C. C. ANDREWS,
Chief Fire Warden.

R. C. DUNN (State Auditor),
Forest Commissioner.

DUTY OF RAILROAD COMPANIES IN MINNESOTA RESPECTING
THE PREVENTION OF FOREST AND PRAIRIE FIRES.

STATE OF MINNESOTA,
OFFICE OF CHIEF FIRE WARDEN,
ST. PAUL, MINN., April 9, 1901.

To Railroad Companies Operating in Minnesota:

The law of April 18, 1895, for preventing forest and prairie fires makes it the duty of railroad companies operating any railroad in Minnesota to

Use efficient spark arresters.

Keep the right of way cleared of combustible material.

Post at their stations warning placards.

Extinguish fires along the line of their road.

The following is a part of Section 12 of the above mentioned Act of April 18, 1895: "It shall be the duty of all railroad companies operating any railroad within this state to use efficient spark arresters on all their engines and to keep their right of way to the width of fifty (50) feet on each side of the center of the main track cleared of all combustible materials and safely dispose of the same within said limits of their right of way between the fifteenth day of April and the first day of December. No railroad company shall permit its employees to leave a deposit of fire or live coals, or hot ashes, in the immediate vicinity of woodland, or lands liable to

be overrun by fires, and where engineers, conductors or trainmen discover that fences or other materials along the right of way or woodland adjacent to the railroad are burning or in danger from fire, they shall report the same promptly at the next telegraph station that they may pass. In seasons of drouth railroad companies shall give particular instructions to their employes for the prevention and prompt extinguishment of fires and they shall cause warning placards furnished by the Forest Commissioner to be posted at their stations in the vicinity of forest and prairie grass lands, and where a fire occurs along the line of their road they shall concentrate such help and adopt such measures as shall be available to effectively extinguish it. Any railroad company willfully violating the requirements of this act shall be deemed guilty of a misdemeanor and be punished by a fine not exceeding one hundred (\$100) dollars for each such offense, and railroad employes willfully violating the requirements of this section shall be guilty of a misdemeanor and be punished by a fine of not less than five (\$5) dollars nor more than fifty (\$50) dollars."

Each railroad company is requested to furnish this office with a copy of the instructions which it shall give to its division superintendents, conductors, road masters, section foremen and other employes with a view to a faithful compliance with the foregoing provisions of law.

Respectfully,

C. C. ANDREWS,

Chief Fire Warden.

The following sample of correspondence shows the exemplary attention that railway companies are giving to this matter:

NORTHERN PACIFIC RAILWAY COMPANY.

OFFICE OF THE GENERAL SUPERINTENDENT.

M. C. KIMBERLY,
General Superintendent.

ST. PAUL, MINN., April 19, 1901.

SUBJECT:—Placards and circulars to be posted.

MR. C. C. ANDREWS, *Chief Fire Warden, St. Paul, Minn.*

DEAR SIR: With this I hand you instructions issued by Superintendent Blanchard to our Minnesota Division, in relation to disposition of placards and circulars recently sent him.

Yours truly,

M. C. KIMBERLY,

Enc.

General Superintendent.

NORTHERN PACIFIC RAILWAY COMPANY.

OFFICE OF THE DIVISION SUPERINTENDENT.

MINNEAPOLIS, MINN., *April 18, 1901.*

Circular No. 343.

AGENTS, SECTION FOREMEN AND ALL EMPLOYEES:

I enclose herewith some warning placards printed on cloth, which, in compliance with Fire Warden Law of April 18, 1895, copies of which are also enclosed, are to be posted inside and outside of depots, section houses, etc., in a position where they can be seen by all.

All employes are cautioned to pay particular attention to the provision of this act, as the penalties imposed by failure to comply are severe. Agents will deliver to section foremen as many placards as they may require, also a copy of the Fire Warden Law.

E. C. BLANCHARD,

F. C. H.

Superintendent.

FIRES ON INDIAN RESERVATIONS.

During the dry season there were fires which did considerable damage to the pine forests on the White Earth Indian Reservation. A report of these fires from the United States Indian Agent will be found among the fire warden reports. In respect to the Mississippi, Leech Lake, Lake Winnibigoshish and Cass Lake Indian Reservations, comprising 611,592 acres and probably five million dollars worth of standing pine, I do not think the damage by fire exceeded ten thousand dollars. That was also the estimate of one of the county commissioners of Cass County. After the dry spell was over the sub Indian agent stationed at Cass Lake wrote me in reply to my inquiry that he had not heard of any serious fires on those reservations. I went over portions of the reservations myself and saw no evidence of nor could learn of any very serious fires.

PATROLS ON INDIAN RESERVATIONS.

On account of the value of the standing pine on the reservations last mentioned (known as ceded reservations) and on account of the value of the pine on the "diminished" Red Lake and White Earth reservations (being reservations which the Indians have not ceded), I at the beginning of the last Congress recommended that the Interior Department try and have an item included in the Indian Appropriation Bill to enable the Commissioner of Indian Affairs to employ patrols during dry and dangerous weather to guard against and extinguish forest fires on those reservations. The Commissioner of Indian Affairs made such a recommendation, it was approved by the Secretary of the Interior and the Senate included the item of \$4,320 for the employment of 24 mounted men, to be selected solely with reference to fitness, Indians preferred and employed if possible. Very much to my surprise the House Conference Committee insisted on striking the amendment out, which was done, but for what reason I have never been able to learn.

I made a similar recommendation for the employment of patrols on the ceded reservations before mentioned, as the following correspondence will show. The item was duly transmitted to the House Committee on Appropriations, with the expectation that it would be included in the Sundry Civil Bill. A representative from this state who is on the Committee assured me that he would give it his support. It, however, failed of being reported by that Committee, but for what reason I have not been able to ascertain. This office was to have nothing to do with the employment of the patrols. They were to be employed, if the money had been voted, by the Commissioner of Indian Affairs on the "diminished" reservations and by the Commissioner of the General Land Office on the "ceded" reservations.

TREASURY DEPARTMENT,
OFFICE OF THE SECRETARY,
Washington, December 21, 1900.

SIR: I have the honor to transmit herewith, for the consideration of Congress, copy of a communication from the Secretary of the Interior of this date submitting a special estimate of appropriation for protection from fire of valuable timber on the ceded Chippewa Indian Reservation in Minnesota, \$6,750.

Respectfully,

O. L. SPAULDING,
Acting Secretary.

THE SPEAKER OF THE HOUSE OF REPRESENTATIVES.

DEPARTMENT OF THE INTERIOR,
Washington, December 21, 1900.

SIR: I have the honor to transmit herewith a recommendation from the Commissioner of the General Land Office urging that a special emergency fund be appropriated by Congress for the protection of valuable timber on the ceded Chippewa Indian Reservation in Minnesota from fire. Accompanying this recommendation will be found a copy of a letter from Mr. C. C. Andrews, chief fire warden of Minnesota, dated St. Paul, Minn., December 1, 1900, in which it is stated that this timber is valued at about \$5,000,000, and covers that section of the State which it has been urged to be set aside as a national park, covering the head waters of the Mississippi and its tributaries.

The recommendation as made by the Commissioner meets with my approval, and I would recommend to Congress that a provision be added to the sundry civil bill as follows:

To enable the Secretary of the Interior to employ necessary fire patrols to guard against and extinguish forest fires in the Chippewa ceded Indian reservations in Minnesota, six thousand seven hundred and fifty dollars.

Respectfully,

E. A. HITCHCOCK,
Secretary.

THE SECRETARY OF THE TREASURY.

DEPARTMENT OF THE INTERIOR,
GENERAL LAND OFFICE,
Washington, D. C., December 18, 1900.

SIR: I have the honor to transmit herewith, for your consideration, copy of a letter, dated St. Paul, Minn., the 1st instant, from Mr. C. C. Andrews, chief fire warden of Minnesota, urging that a special, or emergency, fund be appropriated by Congress for the protection of the valuable timber on the ceded Chippewa Indian reservations in Minnesota from fire.

Mr. Andrews states that this timber is valued at about \$5,000,000 and covers that section of the State which it has been urged be set aside as a national park, covering the head waters of the Mississippi and its tributaries.

Inasmuch as there is no special fund out of which fire patrols could be paid for the particular service here suggested, I concur in Mr. Andrews' recommendation that a special fund be provided for that purpose, and I therefore recommend that a provision be added to the sundry civil bill, as follows:

To enable the Commissioner of the General Land Office to employ necessary fire patrols to guard against and extinguish forest fires in the ceded Indian reservations in Minnesota, \$6,750.

Very respectfully,

BINGER HERMANN,
Commissioner.

The SECRETARY OF THE INTERIOR.

ST. PAUL, *December 1, 1900.*

SIR: I think it may be assumed that the standing pine on the ceded Chippewa Indian reservations in Minnesota is of the value of about \$5,000,000, and that it is found on as many as thirty different townships. But I am informed that you have no fund at your disposal for protecting this valuable property from forest fires.

The prevention of forest fires on these ceded pine lands would tend to prevent the spread of fires into adjoining territory; also lend moral support to the forest protection which is being attempted in this State.

I think a trusty mounted patrol for each township, to be employed during dry and dangerous weather—and three months ought to cover such a period in any year—would be able to guard against forest fires. It would not do to employ cheap men. I would sug-



A view of Cass Lake from high ground. Much of the beautiful scenery in this locality has been mutilated by "dead and down" logging during the past two years. Photographed, September, 1900, for the Annual Report of the Chief Fire Warden

gest that each patrol be paid \$75 a month, for which he should furnish a horse and pay all expenses. At this rate the cost of employing thirty men three months each year would amount to \$6,750.

I therefore strongly recommend that you endeavor to have an item like the following included in the proper appropriation bill:

"To enable the Secretary of the Interior to employ necessary fire patrols to guard against and extinguish forest fires on the ceded Indian reservations in Minnesota, during dry and dangerous weather, \$6,750."

Of course such an item would be in the nature of an emergency fund. The money would not be expended unless dry and dangerous weather prevailed.

Very respectfully,

C. C. ANDREWS,
Chief (Forest) Fire Warden.

HON. B. HERMANN,
Commissioner of the General Land Office, Washington, D. C.

ESTIMATES OF APPROPRIATIONS REQUIRED FOR THE SERVICE OF THE
FISCAL YEAR ENDING JUNE 30, 1901, BY THE
GENERAL LAND OFFICE.

Protection from fire of the timber on ceded Chippewa Indian reservations in Minnesota:

To enable the Secretary of the Interior to employ the necessary patrol to guard against and extinguishment of forest fires in the ceded Chippewa Indian reservations in Minnesota (submitted)..... \$6,750

"DEAD AND DOWN" LUMBERING.

In previous reports I have strongly protested against the above system of lumbering.

A recent visit to two of the Chippewa Indian reservations satisfies me that there are good grounds for the common impression that the Indians are being wronged—I may as well say robbed—by the cutting of pine timber

under the "dead and down" timber law and that the way this law is administered offers a premium for causing forest fires. There are 7,000 Chippewa Indians in a dozen different bands, scattered for two hundred miles from east to west in northern Minnesota, with many settlers in their vicinity, and it is very important that they have no good cause of dissatisfaction. Their pine forests are worth eight million dollars. Under the existing treaty this pine on the ceded reservations must be sold in 40 acre tracts, but from various causes such sale is held in abeyance. Ordinarily, once in six or eight years, from unusual blow downs of pine or from fire, there might be occasion for cutting a few million feet of pine under the "dead and down" law. But through eagerness of people to get the pine, the Interior Department, which has good intentions towards the Indians, has been so misinformed as to permit extensive lumbering operations under the law for years in succession.

I went and looked in the last part of April at the pine logs, probably twenty million feet, partly in boom and partly in piles at Wolf Lake and Pike Bay, on the reservation which includes Cass Lake, and at Elbow Lake in the eastern part of White Earth reservation and think that 70 per cent of all I could see were of green and growing trees. There were enough that were unsound and worthless or that were wholly blackened by fire to apparently lend bad character to the whole. In this system of lumbering the logger contracts to cut and haul and boom in water whence they can be floated to a mill or to pile near a railroad the "dead and down" timber. He is paid so many dollars a thousand for doing this, and if his contract is a good one, it is for his interest to cut as much as possible. The numerous substantial log houses at the camps, and the roads made and bridges built in the vicinity of the operations, as well as the logs themselves all betoken extensive lumbering. Having

reached the place of transportation the government sells the logs to various lumbermen who will pay the highest price for them. It is the universal opinion that under this system it is impossible to prevent the cutting of green and sound timber. It is also the common opinion that fires are set in order to make a cause for cutting timber in this way. I am confident that at least fifty million feet of sound timber have been cut the past winter, and judging from hearsay about one hundred million feet have been cut. Of course I have not the means of knowing whether the Indians will receive the full value of the pine, but my impression is that they will not receive its full value within from fifty to one hundred thousand dollars. However that may be, this is certain that under the guise of cutting "dead and down" timber, a great deal of green timber is being cut, and the whole business has a character of fraud and tends to excite in the Indians discontent, disrespect for the government and white people generally.

There is a remedy for this abuse and it ought to be applied speedily. The administration of the Indian pine forests in Minnesota is not a local but a national matter. It concerns the people in the older states as much as it does the people in Minnesota, for it involves the honor of the United States Government. These lands should be administered on forestry principles; by which is meant that the mature trees should be cut and marketed as rapidly as practicable and the young trees left to grow; and all protected from fire. The tops and branches would not be left as now, a menace in dry weather to the safety of the remaining forest. There are plenty young men in this country already trained in theoretical and practical forestry and who would be glad to take charge of these forests and would take professional pride in managing them in an economical manner. The government could do nothing better to inspire the respect and good will of the Indians than to place these pine lands under scientific forestry management.

PLUNDER OF PINE LANDS—NEED OF MORE FOREST RESERVES.

While much credit is due to the government of the United States for having put in practice within the last ten years the plan of creating forest reserves, mostly in mountainous regions, still it is a painful fact and one with which the friends of forestry ought to be acquainted that, excepting what has been done in regard to forest reserves the disposal of pine lands has been prodigal and wasteful.

Up to about 40 years ago the pine lands in the United States, as fast as they were surveyed, were advertised to be sold at public auction to the highest bidder with the provision and understanding that when the sales at public auction had been concluded the remaining lands could be purchased at private sale at \$1.25 per acre. The result was that very few lands were sold at public sale. After the auction sales were over speculators in pine lands, who had had their cruisers select the most valuable tracts, came in and purchased at \$1.25 lands which were actually worth anywhere from \$25 to \$100 an acre. The government, it must be remembered, had never examined the lands and did not know the value of one quarter section from another.

Since an end was put to the public and private sale of pine lands, various other methods have been in use for obtaining title to such lands, none of which have been legitimate. Considerable so called "scrip" has been issued under different Indian treaties which, under the regulations of the Interior Department, could be assigned and located by the holder on public lands. Twenty-three years ago a law was passed allowing soldiers, who, under the homestead law had taken less than 160 acres, to receive a certificate from the Commissioner of the General Land Office of their right to take anywhere as much additional land as would make up the full 160 acres.



White and Norway pine, near Wilkinson Station, west shore of Leech Lake, on the ceded Indian reservation. Forest for "selection" cutting. Practically a normal forest. But if the present practice prevails it is liable in two or three years to be cut as "dead and down" timber. Photographed September, 1900, for the Annual Report of the Chief Fire Warden of Minnesota.

These certificates were bought of such soldiers at a very low rate, they could be transferred and the holder could locate them upon valuable pine lands belonging to the United States. These certificates generally called "scrip" have been worth upwards of \$8 per acre and the pine lands upon which the holder located might be worth \$50 or more per acre. This "soldiers'" additional homestead law was not enacted for the benefit of the soldier, but was a cunning scheme to plunder the government of its pine lands.

Another system of obtaining pine lands from the government is under the homestead law. The homestead law, however, was designed to enable the actual settler to obtain title to 160 acres of agricultural land by occupancy and cultivation. Before he can obtain a title to the land he must make an affidavit that he takes it for the purpose of "cultivation" and not for speculation. It is not uncommon, however, to find a man holding under the homestead law a claim of 160 acres of pine lands the pine on which is worth from five to eight thousand dollars, and the "settler" will be found spending most of his time smoking good cigars at a hotel in the nearest town. Obtaining pine lands under the homestead law is fraudulent.

Another way of obtaining pine lands from the government is the privilege of purchasing 160 acres of such land at \$2.50 an acre, under the Stone and Timber Act. This law provides that no one person can buy more than 160 acres, but if the person is going into the lumber business, he needs more than 160 acres. People who buy the land in this way, sell out to large individual or corporate holders. The land thus purchased may often be worth over \$50 an acre, and it was cunningly designed to enable large holders of pine lands to acquire title to the same at a low price. Of course, it would never do for Congress to say that any large corporation could buy up 20,000 acres of valuable pine lands at \$2.50 an acre, but that object is accomplished just the same in a round about way.

Now these unpleasant facts ought to stimulate the friends of forestry throughout the country to demand of their Senators and Representatives in Congress, and of the President, a reform of this pine land system of plunder. Apparently the most practicable reform would be to have all of the remaining public pine lands created into forest reserves, and treated on forestry principles.

MINNESOTA'S INTEREST IN FORESTRY.

The cutting of pine timber has been going on increasingly in Minnesota for over fifty years. The use of logging railroads facilitates consumption and the average value of the pine just as it stands in the woods that is now annually cut, is six million dollars. This great industry employs many thousands of workmen. As the benign mother of wages, let alone the benefit of future supply and cheapness of lumber, we should take heed that the industry be not ruined. To-day there is scarcely a lumber yard in Minnesota in which is not found lumber from the Pacific coast competing with our home products; and the railroad companies operating to the coast are looking forward to the time when the bulk of lumber consumed in this state will be brought from the primeval woods of Oregon and Washington. For any one who will need to buy lumber in the next twenty-five years, it will make a difference of hundreds of dollars whether we go on in our present wasteful consumption of the forest, or whether we inaugurate measures for forest regeneration. Probably there are twenty billion feet of pine still standing in Minnesota, and principally in the counties of Cook, Lake, St. Louis, Itasca, Cass and Beltrami. There is still some left in Carlton, Pine, Kanabec, Mille Lacs, Aitkin, Morrison, Crow Wing, Todd, Hubbard and Becker. There remains much cedar, spruce, balsam and tamarack, immense quantities of poplar, and an extensive supply of

other deciduous woods. Altogether the value of the standing timber in Minnesota may be estimated at one hundred million dollars. Over one hundred million dollars worth of pine alone has been cut and marketed. Most people know that hard wood timber land has a natural fertility which makes it suitable for farming, and when the timber is cleared from such land, it is expected that it will ultimately come under the plow. It is different with most of the land which naturally bears coniferous forest such as the pine. And herein is the significance of forestry for the people of Minnesota, that the pine will in our climate earn by its growth a net income on the capital it represents of three per cent compound interest on refuse land—land that is too sandy, or too hilly, or too rocky for profitable cultivation. Air and water are the principal food of the pine. No matter how low our temperature falls in winter, or how high it rises in summer—no matter what the vicissitudes of our climate may be, yet there is the pine ever thrifty and beautiful.

A characteristic feature of our rural landscape is the modest dwelling and large barn. The large barn! How much is expressed in those few words. Surely the barn-builder (the farmer) is one of the principal consumers of lumber. There are 10,000,000 acres of land in Minnesota suitable for agriculture, but not yet cultivated and the progress of its development will depend not a little on the cheapness of lumber.

Before treating of the business part of forestry, let us notice some of its more popular features. For example, the forest is a natural reservoir of moisture, and at the headwaters of important streams should be held to maintain water-flow. Forest is scenery. It is the best part of some of our landscape, and around some of the finest lakes it should be preserved for scenery. The atmosphere of the forest is cooler in summer and warmer in winter than the atmosphere of open country. It is richer in ozone than

the air of open country. But if the public wants forest for a health resort, or for scenery, or to maintain water flow, then the public must own the forest. It cannot require private individuals to hold land in forest for public use.

Forestry is the science of raising crops of trees for profit, and specially concerns us because the pine—the favorite tree of commerce—has its home in our state. Coniferous forest, such as the pine, takes from the soil only a twelfth part of mineral substance required for field crops. It will flourish on soil that is too hilly, too rocky, or too sandy for field culture. There are in scattered localities, and mostly in Northern Minnesota, an aggregate of 3,000,000 acres of such land, which is now useless and yearly growing poorer, and which should be put and kept in forest by the state. This is the important problem for Minnesota. The average annual growth of pine on sandy soil in the state forests of Saxony is 225 feet, board measure, per acre. There are 430,000 acres of such forest, and consequently the annual average growth in the whole forest is 96,000,000 feet, which amount of mature trees could annually be cut and leave the capital unimpaired. The average growth in this country is about the same.

The leading principles of forestry are these: Forest should occupy only non-agricultural land; should be treated as inviolable capital, and no more harvested in a year than equals the increment the same period; when young should be crowded to promote height growth; the cutting should be done so as to promote natural regeneration by seed from neighboring trees.

Forestry is business, and its aim is to get the best continuous revenue from capital. The pine does its fastest growing the first eighty years of its life. Then, as a rule, it has reached its fiscal age, and should be marketed. Suppose we owned a tract of virgin or natural forest,

According to forestry, we should, at the earliest moment, put it in such a condition that it will, by its growth, be earning good interest on the capital it represents. Probably most of the trees are mature. They have ceased to earn interest, are dead capital, and should be sold and cut as soon as the market will justify. The young trees, if there are any, will be left to mature. If a young growth has not started in the midst of the mature trees, or does not start soon after the mature trees are cut, then the ground should be replanted or sown.

THE NATIONAL PARK QUESTION.

The creation of a national park in Minnesota is no new matter. The Legislature of Minnesota in 1891 passed the following memorial to the president of the United States to set apart a tract of land of not less than 40,000 acres in extent in northern Minnesota for a national park:

WHEREAS, Congress has delegated to the president of the United States the right of setting apart for national parks such lands, not entered nor settled, as in his judgment will contribute to the general welfare; and

WHEREAS, There are not less than three million (3,000,000) acres of such lands in the northern part of Minnesota, mostly bordering Rainy river and Rainy lake, making a belt of extension east and west of over one hundred (100) miles, comprising mainly non-arable lands which can be better forested to promote rainfall and humidity in our atmosphere, to the advantage of agriculture and correlative industries, and add to the beauty of the state and healthfulness of the climate: Therefore,

Resolved, the Senate concurring, That the president of the United States be and he is hereby requested and petitioned to set apart a tract of land along the northern boundary of the state, between the mouth of Vermillion river on the east and Lake of the Woods on the west, not less than forty thousand (40,000) acres in extent, for a national park, with such provisions for protection against depredations and fires, and for reforestation of denuded sections, as will constitute it one of the forest retreats of the country.

Resolved, That the governor, the secretary of the State Board of Agriculture and the secretary of the State Forestry Association be and they are hereby constituted a Minnesota national park committee, to communicate with our members of congress and the president, with a view to secure a survey and organization of said park as soon as possible.

Considering the extent and splendor of the original pine forests in Minnesota and the millions of money that private individuals have derived from them and that the government of the United States has never received in money as much as seven million dollars for all the lands it has disposed of in Minnesota (not including those granted to the state and to railroad companies) it would seem as if a few thousand acres of pine forest could be spared as a means of health and recreation for the people at large. There is no place more healthful and delightful as a summer resort than the pine woods. The whole world is open to the wealthy for recreation, but the poor can seldom go away from their own state. It was because a number of tired people had asked me where they could go and spend a few weeks in pine woods that my attention was first attracted to the pine forests about Cass Lake as a suitable region for a park or forest reserve; it was commended to my judgment on account of its being a beautiful pine forest in the vicinity of delightful lakes, its central location and accessibility by railways. My first idea was to secure the beautiful wooded island in Cass lake and a few thousand acres of pine forest around Cass lake for a park; but as there appeared to be a popular demand for a park of larger area I acquiesced in the latter plan; which was to include less than five hundred thousand acres after deducting Indian allotments and water surface. I for my part will be satisfied with a park of reasonable dimensions and trust that a compromise can be arrived at between the friends and opponents of the park. I would be willing to leave the matter to the decision of any com-



Norway pine on the ceded Leech Lake Indian Reservation. The most of this
 should be left to grow thirty years longer. It is a forest not for clean but for "se-
 lection" cutting—the system of cutting that is common and more into use in
 Europe. Photographed, September, 1900, for the Chief Fire
 Warden of Minnesota.

petent and disinterested committee that the president or congress might select.

Of this fact I am certain, that if the government would negotiate anew with the Chippewa Indians interested in the land and pay them in bulk the Indians would receive much more money for it than they will receive in selling the pine lands in forty acre tracts under the existing agreement. Assuming that the United States were to pay the Indians a lump sum of five million dollars for these lands; the Indians would be paid in installments of one hundred thousand dollars a year for fifty years which would complete the payment. By administering the pine lands on forestry principles the government would derive one hundred thousand dollars a year on an average. The pine timber would pay for the park.

There are nearly fifteen hundred Indians in scattered villages or groups now living on the reservations. The government has agreed that they may remain where they now are; and so far as I am informed the friends of the park desire them to remain.

Of course it will not be claimed that the Indians will be contaminated by the presence of such white people as travel for recreation. On the contrary, the Indians will learn refinement by contact with them. They will thus find a better market for the neat products of their looms; also, employment as guides and boatmen. If the park be established the pine forest will be treated as a forest reserve, and, according to forestry principles, it will be watched and fires kept out. The mature timber will be cut and honestly sold as fast as the market will justify. The young timber will be left to grow to merchantable size. Land that is only fit for bearing pine will be kept in forest so as to furnish a sustained yield and perpetual income. It will contribute to cheapen lumber. Of course trees on the shores of lakes and those requisite for scenery will not be cut. If there is land anywhere that is better

for agriculture than for coniferous forest it can be cultivated. Treated as a forest reserve, these reservations will prove a protection and covert for useful birds and game. Will that not be better for the Indians than to have the woods all cut clean and left a wilderness of stumps, as will occur if the park be not created?

If we draw a line across the state west at Duluth we find that north of that line and within the state are twenty million acres of land exclusive of water. Of this land only one million acres are under cultivation. One may say that these twenty million acres are largely tributary to Duluth. Now, all of the area of land that can possibly be obtained for the national park is only 489,790 acres, or less than one-fortieth part of the land that is tributary to Duluth. Even if the park were all fairly good agricultural land, would it be candid to say that its benefit to Duluth from farming could outweigh the advantages that would accrue from it as a park from travel and trade? But while there are portions of these reservations that may be good for farming, as a whole they are not good agricultural lands. That is the testimony of Mr. B. C. Baldwin, an old government surveyor who is personally acquainted with the lands, and who is at present the chief clerk of the U. S. surveyor general's office. It is also the testimony of many competent judges of land. But, as has been said, the friends of the park are willing that any agricultural lands shall be excluded from its limits. A candid discussion of this question will help educate public opinion on forestry. One of the worst errors which crops out in the discussion and which should be corrected is that a forest is necessarily a dense wilderness calculated to obstruct communication and block the development of the country. A forest may contain roads, population, industries and villages. The "Black Forest" in Germany has less area than St. Louis county, yet contains a million inhabitants. There are well cared for woods within five minutes walk of a city.



Some have said: "Why not make a park of the Vermillion Lake region?" Because it is mostly private property, and it would not be practicable to acquire it. The site proposed has been visited and recommended by committees of both of the state medical associations of Minnesota.

The proposed park comprises some large tracts that form a part of the head waters of the Mississippi. This may seem commonplace to us here in Minnesota, but to people of the older states it is a striking fact. The head waters of the Mississippi, and the original home of the aborigines! Truly that is no common spot. It comprises some of our best scenery. Having been occupied hitherto as Indian reservations, the primeval forest thereon remains practically intact and remarkably accessible to railroads. If we do not husband the whole or a part of it, we shall miss a golden opportunity for our state.

AGE OF THE PINE.

The following observations on the age of certain pine forests in Itasca and St. Louis counties have been furnished me by Mr. Herman H. Chapman, superintendent of the Northeast Experiment Farm, Grand Rapids, Minnesota :

Every type of forest has its chief enemies, and some forests are more susceptible to the attacks of one enemy than another. Broad leaved species, as oak, are well protected against fire and wind, but are vulnerable when attacked by drought or insect enemies. Forests of conifers are not attacked by caterpillars, but fall an easy prey to winds and fires. Before the advent of the lumberman, fires either of human or natural origin were rare. But the fact that fires and winds have always been a menace to coniferous forests is easily shown. A very large per cent of the pine forests of Minnesota grew in groves of uniform height. A count of the annual rings would usually show most of these groves to be composed of trees of equal age. In order that these trees should all start into growth the same year as they did, certain peculiar conditions must have existed. Thick stands of young pines, especially Norway, do not spring up in the shade of forests of older trees. They demand light, as is shown by their usually rapid growth when young, both in height and thickness.

Whoever has seen a thick stand of young Norway or white pine springing up after a cutting or fire, has obtained a clue to the origin of such even aged stands of

pine. It is perfectly safe to say that such stands originated in no other way than by taking possession of a clearing made by some violent natural or human agency. As human agencies have not operated in Minnesota beyond half a century, barring the Indian, whose influence was slight, there is but one conclusion left, that winds and fires have been of sufficiently frequent occurrence in the primeval forest as to become a large and important factor in determining its form and composition.

During the winter of 1900-01 the writer made observations on the age and stand of timber over a wide area in Itasca and St. Louis counties, for the purpose of gathering information which might throw some light on its possible origin and history. The facts brought out in this brief survey were peculiarly interesting. The first cutting examined was a grove of Norway very densely grown, and almost a pure stand. There were a few white pines, but without exception these were very small and stunted. The Norways were uniformly 138 to 140 years old at height of stump. The young pines grow very slowly for the first two or three years and the rings on the stump would only indicate the number of years elapsed after the tree reached that height. The more vigorous seedlings would first attain the height of the stump—about two feet, and would show the greatest number of annual rings on the stump—a point which was borne out in this case. The trees which showed 140 annual rings were in each case the largest in diameter, showing that they had early secured an advantage in the struggle for light, which they had maintained. All trees were about the same height. Individual trees in even aged stands of pine maintain their relative height, but suffer in diameter if they are crowded by their neighbors. It is safe to calculate the age of this grove as 142 years.

The white pines were also all of an even age, but the cause of their suppression became evident on noticing that they were but 130 years old. As the soil was sandy and better adapted to Norway than white pine this fact and the handicap of twelve years in favor of the Norway proved their doom.

About a mile from this cutting the main body of timber was found to be approximately of the same age as in the former, 142 years. But in this spot stood a few very large white and Norway pines whose age was, for those counted, uniformly 318 years.

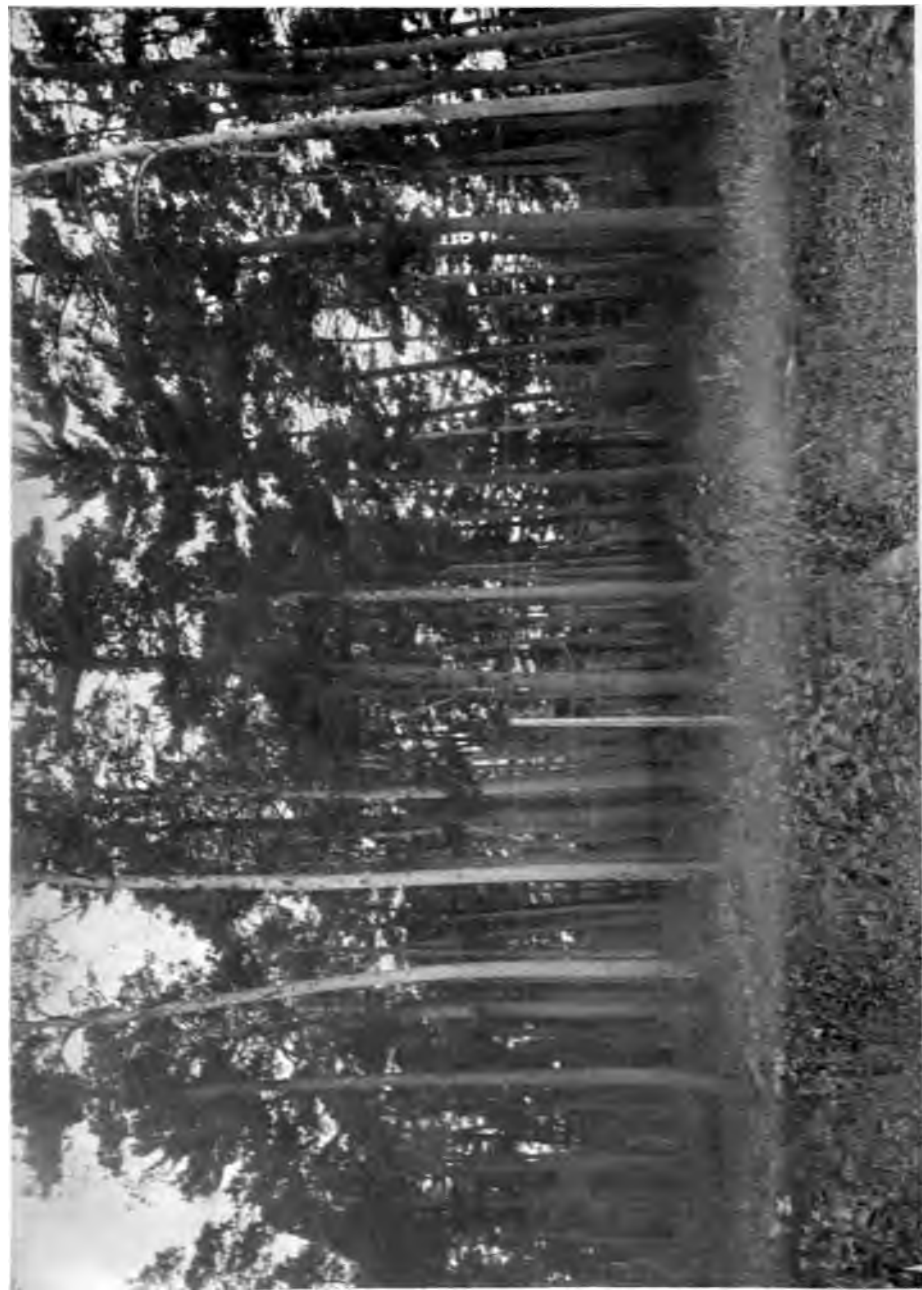
Next, a grove of rather scattered and scrubby Norway, located five miles from the first, was studied. Here the oldest and largest trees again proved to be 142 years old. But in this grove most of the trees were but 103 years old, and some were aged 90 years and 71 years respectively. The oldest trees bore the marks of a fire which had run through the woods just 130 years ago. The thin stand and uneven ages of the timber were here evidently due to the damage done by this fire, and to subsequent re-seeding. These data were all from fresh cuttings in Township 59 North, Range 24 West. A little later, some timber in Township 62 North, Range 23 West, was inspected. This was in an air line 20 miles from the first, although much further by road. The age of the Norway cut here was found to coincide very closely with that in the other cuttings, namely, 142 years for the oldest trees, if the age of the stump is considered. There were several fire scars on these trees, and by a close comparison of different trees the records were shown of three fires that had occurred at intervals of about 12 years, while the forest was yet small, the first when the pines were about 10 years old. The last of these fires had only burned its way into such trees as had a permanent scar in the bark left by the preceding fires. In this grove was also found older timber—a few surviving trees of Norway and white pine. The Norway was 287 years of age, while the white pine was about 248 years old.

At another time, when near the junction of the Floodwood and St. Louis rivers, the age of a clump of Norways which grew on the bank and had been cut about two years, was calculated, and found to be, at the time of cutting, about 140 years, making them the same age as the timber in these other groves. This locality is 60 miles in an air line from the last named cutting. This remarkable coincidence of even age in trees scattered over such a wide extent of territory can only be explained in one way. Some time just prior to the year 1759, or 142 years ago, there must have occurred an immense and widespread destruction of the standing forests in this region either by wind or fire, or both. Wherever the destruction was not complete and clumps of old trees were left, seed was sown on the barren ground and produced these scattered groves of Norway timber, which the lumbermen are now cutting. Groves of about the same height and size are found distributed over this whole region, and it is fair to assume that they in common with those examined came into existence at this time.

Many localities in this district appear to have suffered so severely from this or other cause that the pine forest did not renew itself, but allowed the poplars and birch to take possession. There is an old Indian tradition that five or six generations ago the pine forests were much more extensive in Northern Minnesota than when the lumbermen found them. These facts would seem to indicate that the Indian may be right.

EUROPEAN FORESTRY.

No intelligent friend of forestry supposes that the science of forestry will, for a long time, produce in this country the results which are seen in many of the densely peopled states of Europe, but a knowledge of these splendid results is very instructive and stimulating, and for that reason I have taken pains to diffuse such information. The science of forestry is the same everywhere, but its application depends upon the conditions which are found in different countries. Let us assume that there is a natural coniferous forest on non-agricultural land in Germany in which 75 per cent of the trees are mature and 25 per cent have not reached merchantable size. According to scientific forestry the 75 per cent of mature trees will be cut just as soon as the market would justify and the 25 per cent of trees of unmerchantable size would be left to grow till they should be fit to cut. A similar natural forest in this country would be treated in the same way, if treated according to forestry principles; and some lumbermen, such as those, for example, who hold pine lands in the valley of the St. Croix river or on its tributaries in this state, and who have gone back every fifteen or twenty years to make a second, third or fourth cutting on the same land, are managing their forests in this way. In cases where pine lands are remote from streams of capacity for floating and where the pine is reached by temporary logging railroads, clean cutting is made of both large and small trees; but lumbering of this latter description is in violation of forestry principles. If a trained forester were to commence cutting a mature forest he would not begin on that side of it which is exposed to the prevailing wind, because if



Norway Spruce forest bordering the Great Northern Railway on the south side of the Lake Indian Reservation. (Part of the proposed National Park.) Photographed, September, 1906, for the Annual Report of the Chief Fore Warden of Minnesota.

he did every cutting would freshly expose the remaining forest on the side of the cutting to dangers from the wind. Instead of that he would begin on the side opposite the prevailing wind, leaving the forest border, long years hardened to the wind on the windward side, as a protection to the forest. Now, that is a principle of scientific forestry and is just as applicable in this country as in Europe. Again, a trained forester in Germany would manage the cutting so as to promote natural seeding from the nearest trees left standing, and that principle is just as applicable in this country as in Europe. If a person in this country were to begin to manage a natural forest on forestry principles he would first have it surveyed; he would ascertain the number, contents and situation of the mature trees; he would gradually make necessary roads; he would make a map of his forest and prepare working plans for its administration and ascertain where he could sell the mature trees at the highest price; these would be the essentials that he would perform, and he would be doing just the same as a German forester would do with a forest in Germany. Owing to the denser population, cheaper wages, better roads, and very much higher value of land and forest products, the results of forestry are very much different there from what they are in this country, or will be for many years. But the cause of forestry in this country will be greatly promoted by diffusing a knowledge of European forestry; and for that reason I reprint from my last report sketches—obtained at great pains and in many instances direct from the respective governments—of the forests and forestry of several European states. A few sketches have been slightly abridged.

ALSACE-LORRAINE.

STATE FORESTS.

Aggregate extent, 338,500 acres, situated in the valleys of the Rhine and Mosel rivers and on the Vosges moun-

tains. The prevailing kinds of trees are fir (*abies pectinata*), spruce (*picea excelsa*), pine (*pinus sylvestris*), oak and beech. The average estimated value per acre is about \$100. Annual aggregate expense of administration, \$862,000; annual aggregate revenue, \$1,712,000; average net profit per acre, \$2.50. The number of acres annually sown with seeds, 610; planted with seedlings, 1,250 acres. On 2,750 acres the surface of the ground is roughly opened with spade, plow, harrow or hoe with a view to facilitate the germination of self-sown seeds. On about 50 per cent of the entire area, reforestation is effected by self-sown seed from standing trees; on about 35 per cent of the entire area planting trees, and on about 15 per cent planting seeds is resorted to.

There is a continuity of forest produce. The annual yield or cutting of the forest is not allowed to exceed the annual production. A decrease of the growing stock, by over cutting the forest, would be considered a criminal offense on the side of the forest administration. The general increase of the productiveness of the forest, however, permits of a gradually, but slightly, increased annual output. The forests consist of more or less averaged sections termed "compartments." Every compartment yields periodically (say in the 50th, 70th and 90th year of the tree life) a certain "intermediate yield," composed of immature trees, removed by way of thinnings. When the remaining trees reach financial maturity, they are removed either by a clean sweep or gradually, the removal proceeding hand in hand with the development of the second growth started underneath the mature trees (fir and beech).

The cutting of forests, with a view of using the soil for agriculture or pasture thereafter, is strictly prohibited since 1803, unless, under certain stated conditions, permission to the contrary effect is granted by the civil government. Any forest ground cleared from tree growth must be planted up within three years after such clearing, if in the opinion of

the forest administration regeneration from self-sown seeds cannot be depended upon. The owner of unproductive lands, when proposing to plant such lands to forest, receives certain contributions out of the treasury of the state. Plantations made on the tops and on the steep slopes of mountains, also plantations made on dunes and on unproductive prairies densely clothed with ligneous weeds, are free from taxes for 30 years. The amount of damage annually caused by forest fires is very little; no data available. The principal cause of such fires, when they do occur, is the careless use of matches and cigars thrown away burning. Very few such fires are annually caused by railroad locomotives; no data available. It may be estimated that in Alsace-Lorraine, as in Prussia, 10 per cent of all forest fires are caused by sparks from locomotives.

The forest service is entirely co-ordinate and equal to the other branches of the public service. The average salary per annum of the "Land Forst Meister" (forest counselor) is \$2,000; of the "Forst Meister" \$1,500; of the "Oberförster" (district manager) \$830; and the allowance for office and traveling expenses of each officer is \$500. All forest officers have the use of an unfurnished house free of charge.

PRIVATE FORESTS.

The aggregate extent of private forests is 771,000 acres, of which 546,000 acres are managed on forestry principles, being owned by towns, villages or public institutions. The forests owned by private individuals proper, aggregating 225,000 acres, are managed at the will of the owner except as above stated. The average value per acre is uncertain; it depends on growing stock, accessibility, quality of soil, etc. However, the average value of the private forests may be roughly estimated at \$75 per acre. The average annual rate of net income is between one and one-half and four per cent. The total forest product of Alsace-Lorraine

is well sustained. The municipal forests yield 70 cubic feet per acre per annum. This quantity is equivalent to about 140 feet of lumber, board measure, and one-half a cord of fuel. The population of Alsace-Lorraine is 1,605,000. The area of the entire territory is 3,625,000 acres, of which 1,110,950 acres are under forest. The annual yield of raw material is 61.1½ cubic feet per acre. Of this amount 40 per cent consists of timber, and 60 per cent of fuel, corresponding with about 170 feet timber, board measure, and four-tenths cord of fuel. The cost of cutting timber and fuel, inclusive of sawing into logs, piling along wood roads, etc., amounts to one and one-tenth cents per cubic foot. At this price the workmen earn 43 cents per day. The value of timber, dragged to forest roads, is 9½ cents per cubic foot, on an average. The value of fuel, piled up along roads, is three and four-fifths cents per cubic foot, or about \$3.42 per cord. The stumpage of timber is worth about \$12 per 1,000 feet, board measure. In the state forests about \$80,000 are spent annually for road improvement and forest railroads. The exclusive right of hunting is periodically leased to the highest bidder, under certain restrictions. These leases yield annually about 4 cents per acre. In the season of 1893-94, for instance, there were killed, in certain districts aggregating 320,000 acres, 42 head of red deer, 451 head of roe deer, 175 head of wild boar, 2,555 hares and 24 capercaillies (mountain cock), besides a number of minor animals.

AUSTRIA.

STATE FORESTS.

The entire forest area of Austria is, in round numbers, 24,000,000 acres, of which the state administers 2,573,940 acres of actual forest, and of which 800,000 acres belong to religious, educational or charitable endowments. Under the Department of Forestry there are eight territorial

offices, and under these eight territorial offices there are 186 local offices. The largest area under the supervision of a single territorial officer is 628,225 acres; the smallest area under the supervision of a territorial officer is 191,498 acres, whilst the average is 452,762 acres.

Including unproductive soil a local range comprises in one case as much as 120,726 acres. If only the productive forest area is drawn into calculation, the maximum size of a local range is 58,993 acres, whilst the minimum is only 1,030 acres. The average size of the forest area under the management of a single local officer is 13,880 acres.

There are two distinct groups of forests administered by the state authorities—one in the east, comprising lands in Galizia and Bukowina, and one in the west, comprising the Alps. Besides, there are some smaller forests lying in the southern and the northern sections of the empire.

Twenty-six per cent of the state and fund forests are lying in the plains and at the foot hills.

Forty-nine per cent of them are lying in the mountains, at medium elevations, growing under conditions favorable to tree growth.

Twenty-five per cent of them are lying in the highest mountain region, extending up to the limit of tree growth.

The species covering most ground is the European spruce (*Picea excelsa*), occupying 49 per cent of the entire forest area. Beech is next, occupying 20 per cent. Then follows the fir, occupying 19 per cent, and the larch, occupying 5 per cent. A small area only is in possession of the pines (only 3 per cent). The balance of 4 per cent is occupied by alder, linden, maple, oaks, elms, aspens, willows, etc. It appears from these figures that the Austrian state and fund forests consist of coniferous woods to the amount of three-quarters and of hard woods to the amount of one-quarter.

In the Alps spruce reaches up to an elevation of 2,000 meters (or 6,562 feet), and in the Karpath mountains to

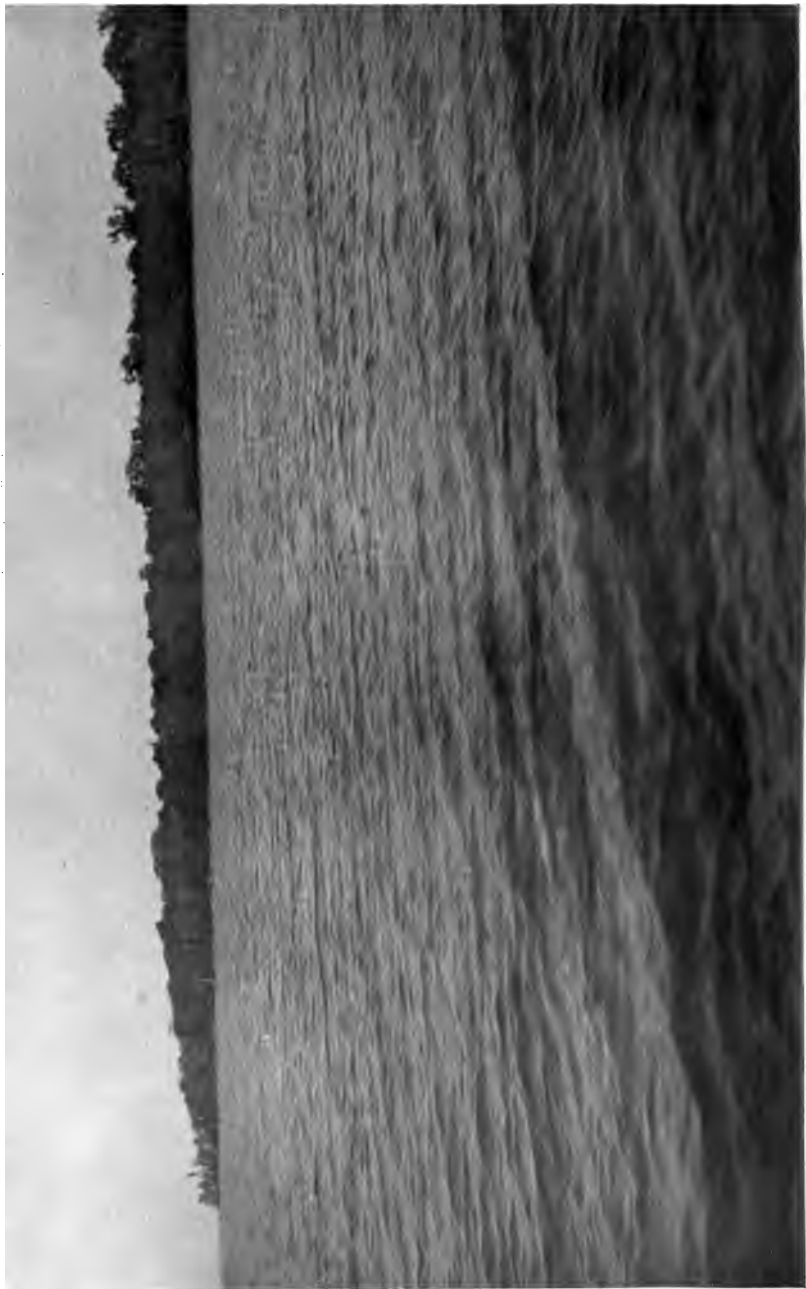
an elevation of 1,500 meters (or 4,921.5 feet). It forms, especially on the high mountain ranges, pure forests in many cases. However, it is often found mixed with other conifers and with hardwoods. In the very highest mountains it shows a poor growth, short boles and bad form, the diameter increasing rapidly from the root to the top. The branches are running down to the ground and are covered with lichens. Spruce thrives best on slightly sloping ground protected from high winds, where the underlying ground is a sandy loam formed from slate. Here the tree shows long, straight and clean boles. However, spruce is found thriving in almost all situations.

Silver fir (*Abies pectinata*) is mostly found mingled with beech, horn-beam and spruce. It does not run as high up in the mountains as the spruce will do. However, it is found in the Karpath mountains at an elevation of over 1,500 meters (or 4,921.5 feet). Pure forests of fir are found only in a few places (Vienna forest, Karpath mountains and Krain).

Larch (*Larix Europæa*) is scarcely ever found forming pure forests. Its favorite ground is an eastern and northern slope where spruce is the predominating species. Under these conditions it rises as high up as 2,200 meters (or 7,218.2 feet). Larch is thriving splendidly on calcareous and sandy loam, especially on well shaded slopes. Larch avoids wet, sunny, and such localities which are exposed to rough winds.

Scotch pine (*Pinus sylvestris*) is found in the Alps and in some dry and poor localities elsewhere. It is running up to an altitude as high as 1,200 meters (or 3,937.7 feet, in southern Tyrol even as high as 1,700 meters (or 5,577.7 feet), here attaining the size of a dwarf only. In the sandy plains of Galizia, Scotch pine shows a good growth and furnishes fine timber.

The black pine (*Pinus Austriaca*) is very scarce on the whole. On the south slopes of the Vienna mountains it



Wecchi Lake, Annette Island, Dig Point from the north. Photographed, September, 1900, for the Annual Report of the Chief

forms small forests. It is fond of the sunny side and of calcareous ground.

It is impossible to ascertain the value per acre of the state and fund forests. This value depends on the locality, on the means of transportation, on the condition of the lumber market, etc. Even an average figure giving an idea of the value of the said forests cannot be given. If the annual net yield per acre is taken as a basis for the valuation of our forests at a rate of 3 per cent, then the average value of the state and fund forests per acre will amount to \$8.91. It is likely to range between \$3.50 and \$20 per acre, according to the possible yield.

During the twenty years between 1874 and 1893 there was expended annually on an average:

I. For forestry proper, namely, forest utilization, transport of forest products, charcoal burning, maintenance of forestry buildings, silviculture, etc.	\$732,578.17
II. For agriculture, namely, expenses for administration and for maintaining buildings.....	9,675.45
III. For other branches, namely, for technological industries, for shooting grounds, fishing, timber yards, etc.....	87,193.67
IV. For administration, including the salaries for all local officers, rangers, guards, etc., their traveling expenses, the expense of keeping up buildings used by these officers, etc.....	418,499.05
V. For public expenses (taxes and charity expenses).	259,867.44
VI. Money refunded	756.13
VII. Extraordinary expenses (purchase of real estate, new buildings, new surveys, demarkation of boundary lines, forest working plans, prescriptive rights, etc.)	143,845.88
VIII. Administration at headquarters (expenses at the territorial offices and at the ministry of agriculture)	151,340.20
Grand total expense.....	\$1,803,755.89

During the same period—namely, during the twenty years between 1874 and 1893—the mean annual gross receipts amounted to:

I. From forestry (sale of fuel and timber, of charcoal, of minor forest produce, etc.)	\$1,727,805.73
II. From agriculture (rentals from land leased, etc.)	161,592.16
III. Technological industries (rents of buildings and establishments, rents from shooting and fishing licenses, rents from yards, etc.)	291,747.02
IV. Money refunded	6,524.15
V. Extraordinary revenue	19,492.24

Total receipts	\$2,207,161.30
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To the latter figures there must be added the value of the prescriptive rights under which the inhabitants of certain villages have the privilege of taking timber, fuel, grass, etc., from the forest without refunding any money for such taking, estimated at..

	290,336.40
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Therefore grand total gross receipts	\$2,497,497.70
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Deducting from this amount the expenses previously mentioned, there remains a net revenue of.....

	\$693,741.81
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Thus the entire state and fund forests of the Austrian empire have netted on an average, during the above named period of twenty years, 26.8 cents per acre per year.

During the five years lying between 1887 and 1893 there were planted up annually on an average 15,614 acres, by means of planting seeds or planting seedlings, at an expense of \$28,586.01 for labor only. To these planting expenses there must be added the annual expenses incurred for the following items, namely:

I. For raising, transplanting and nursing plants in nurseries proper	\$17,894.78
II. For preparatory work, as drainage, subsoiling, making mounds to plant upon, etc	1,694.96
III. For cleaning and attending to the young forest previous to the age of, say, 20 years	6,406.72
IV. Spades, picks, mattocks and other tools	834.02

Adding these items to the above named figure of \$28,586.01, the grand total expense for replanting amounts to \$55,416.49, or to \$3.55 per acre.

Of the entire forest area of 2,590,182 acres, six-tenths of one per cent are planted up annually. Of these, 40.5 per cent were planted with seeds and 59.5 per cent were planted with seedling plants. For planting seeds there were used annually 23,669 kilograms of coniferous seeds; further, 561 hectoliters of acorns and 10,543 hectoliters of walnuts. The number of seedlings planted annually averages 17,604,196, planted out on 9,294 acres.

Regeneration is effected partly from self-sown seed under the cover of mother trees, partly from coppice shoots, partly by planting and sowing after clear cuttings as indicated above. Besides, where natural regeneration fails, planting seeds or seedlings takes place. The number of acres either wholly or partly cut over annually is 18,212. Of these, 55 per cent, or 10,108 acres, are planted up artificially by means of sowing and planting, whereas 45 per cent, or 8,104 acres, are regenerated from self-sown seed or from coppice shoots.

The difference between the area planted up annually, namely, 15,614 acres, with the area replanted annually after a clear cutting just mentioned, namely, 10,108 acres, amounts to 5,506 acres, and may be explained partly from the fact that on a considerable fraction of the 8,104 acres just mentioned artificial help is needed when natural regeneration fails, partly from afforestation of areas not occupied by forest crops heretofore.

The total amount of the annual harvest, or annual cut, on the whole area under the state forest management is pretty constant, whilst it is more or less subject to changes in the different territories or forest ranges, according to market conditions. Owing to the system of roads and railroads in the forest of Galizia and of the Bukowina be-

ing extended annually, the annual utilization of forest produce in the state and fund forests is expected to increase in the future. The annual cut depends on figures prescribed by forest-working plans. It is never allowed to surpass the yield capacity of the forest.

Aside from charcoal burning, forest products are sold before manufacturing takes place. The trees to be cut are felled, freed from branches, and cut up into logs, and, if so desired, split up and freed from bark at the expense of the owner of the forest. "Timber" consists of: (1) Timber fit for building purposes which is not cut up into logs; (2) saw logs, the length of which depends more on the conditions of the logs than the inspection rules; (3) "work wood," which means timbers fit for carriage work, for turnery, etc.; (4) split timber, used especially for cooperage purposes. "Fuel" consists of wood for burning and for charcoal making. The former is cut up into pieces one meter (or 3.281 feet) long, the bark not being removed. According to the diameter of the log from which the fuel is taken, it is sold either split or unsplit. It is piled up according to quality, in distinct and separate piles. Fuel for charcoal burning is cut into pieces two or three meters long.

Relative to the reforestation of ground allotted to forestry, the main rules are found in paragraphs 2, 3 and 4 of the imperial "Patent," dated Dec. 3, 1852, which run as follows: Paragraph 2: "Without special permission, no forest ground must be devoted to other purposes than timber production. If forest ground is used for other purposes than timber production, the owner shall be fined 30 cents to \$1.50 per acre. After such unlawful use the ground must be replanted within a time prescribed by the local authorities. If reforestation does not take place within the time thus prescribed a second punishment shall take place." Paragraph 3: "Areas cleared from forests are to be planted



Photographed, September, 1900, for the Annual Report of the Chief Fire Warden of Minnesota.

up with timber species within five years after the clear cutting in the case of forests owned by the state or by the communities. Wherever there are clearings left from olden times they must be planted up within a period equal to the time fixed for the rotation of crops or fixed as the age of maturity of trees. In the case of private forests, a longer space may be allowed according to circumstances. Whosoever neglects this prescription shall be punished in the same way as if he had used forest ground for other purposes than for timber production." Paragraph 4: "No forest must be devastated; i. e., it must not be treated in such a way as might endanger or render impossible the continuation of timber production. If there is such danger, the fine to be imposed upon the owner of the land shall be the same as if forest ground was used for other purposes than timber production, or as if afforestation was omitted after a clear cutting. Aside from the fine, afforestation shall be made by force, if necessary, the owner bearing the expenses."

If the treatment was such as to render timber production impossible for the future, a fine up to \$3 per acre shall be imposed upon the owner. Under these rules or laws the local authorities have planted up during the years 1891 to 1895:

In state and fund forests, 231 acres; in communal forests, 28,269 acres; in private forests, 126,949 acres.

Preventives against forest devastation were taken:

In state and fund forests, on 1,393 acres; in communal forests, on 328,487 acres; in private forests, on 1,003,342 acres.

The statistics for the years 1891 to 1895 show that there occurred 3,007 forest fires, running over an area of 19,310 acres, and causing a loss of \$163,904. On the yearly average, 601 forest fires have run over an area of 3,862 acres, involving \$32,781 damage.

These fires were caused: By carelessness, in 1,210 cases; intentionally, in 181 cases; by sparks from locomotives, in 118 cases; by lightning, in 26 cases; by unknown agents, in 1,472 cases.

The officers of the state forest administration have a general rank equal to all technical branches of government administration. The forest officers in Austria are divided into two groups, one of which is attending to the administration of the Austrian state and fund forests, while the other is charged with the control and enforcement of all laws and rules enacted with reference to forestry. The latter forest officers are joined to the local political administration.

All government officers are allotted to different grades or ranks, the rank depending on their merit and their age, and being combined with a certain title and with a definite income peculiar to that rank. Forest officers are found in the following ranks: Tenth rank, forest assistants engaged in the administration of state and fund forests, drawing a salary of \$364 to \$405 per annum, to which there must be added an additional pay varying from \$64 to \$162, according to the time which the officer has spent in government service; ninth rank, head foresters entrusted with the local administration, drawing a salary of \$445 to \$526, with an additional pay varying from \$81 to \$202; eighth rank, a forest master, or inspecting officer, draws a salary of \$567 up to \$729 and an addition from \$97 to \$243; seventh rank, a forest counselor draws a salary of from \$810 to \$972 and an additional pay of from \$142 to \$283; sixth rank, a superior forest counselor draws a salary of from \$1,134 to \$1,458, in addition to a pay of from \$162 to \$324, depending on time of service. The traveling expenses, daily allowances on journeys, etc., differ according to the rank of the officer. Many of the local officers are living in government build-

ings, paying a rent equal to one-half of the additional pay above mentioned.

PRIVATE FORESTS.

At the close of 1895 the entire forest area of Austria was 23,993,442 acres. Deducting from this figure the area of the state and fund forests, aggregating 3,782,369 acres (out of which 862,236 were unproductive area), there remain 20,211,072 acres, which are composed of communal forests to the extent of 3,456,782 acres, and private forests to the extent of 16,754,290 acres.

There are treated according to forestry principles proper: In the case of communal forests, 14.5 per cent, equal to 500,818 acres; in the case of private forests, 38.4 per cent, equal to 6,434,070 acres. In these forests all work is done according to working plans, periodically made by officers of a training equal to that of the government forestry officers. In 85.6 per cent of the communal forests (2,955,964 acres) and in 61.6 per cent of the private forests (10,320,220 acres) no working plans exist. The work is done without reference to scientific forestry, more or less at haphazard after empirical rules.

The price of private forests depends on the quality of the soil, the age of the forest, and on the locality, viz., on the market conditions and on the industrial development of the section in which the forest is situated. Thus it is impossible to give even an approximately correct figure representing the value of private forests. Forest land has been sold actually at prices ranging between \$5 and \$340.

The annual net revenue drawn from forestry varies just as much as the value of the forest itself. It is impossible to give any exact figure showing the annual net revenue from private or communal forests. A net revenue of equal to two or three per cent of the capital invested in forestry may represent a fair average.

The annual production of timber and fuel in the Austrian forests has somewhat declined of late. Savings are made everywhere to make good former over-cutting. Besides, the regulations of the forest laws are now being enforced, and under these enforced laws the utilization of forest produce had to be diminished. In the year 1890 the total harvest of timber and fuel from 24,173,333 acres of forest aggregated 29,341,590 cubic meters, or 1,035,758,127 cubic feet. In the year 1895, on the other hand, there were cut from 23,993,442 acres only 27,523,241 cubic meters, or 971,570,407.3 cubic feet.

It may be stated that the smaller figures, representing the area of the forest in 1895, are explained by the fact that the political authorities, whenever they think it fit, after consulting the foresters in charge, approve of a change of forest land into agricultural or pasture land. Besides, the diminished area is partly explained by mistakes made formerly in the survey of the forests.

DUCHY OF BADEN.

STATE FORESTS.

The aggregate extent of the state forests of Baden is 240,304 acres, located in the Black Forest and the upper valley of the Rhine. The prevailing kind of trees is coniferous. The beech, however, covers the largest surface; next follows the fir, then the silver fir and the Scotch fir. The average estimated value per acre, taking the average of the ten years, 1886-1895, is \$98.55. The annual aggregate expense of administration is \$568,078. The annual aggregate revenue amounts to \$1,235,332, and the net revenue is \$667,244. Number of acres annually sown to forest is 222, and the number of acres planted is 823. Reforesting is effected by seed from standing trees; also by planting trees; in some rare cases

by artificial sowing, the latter in the case of firs. There is a gradual increase of crop. The usual method of cutting the crop consists in cutting the mature trees and covers at periods, as a rule, from thirty to forty years, with longer or shorter intervals. Cutting in blocks clean (pines and Scotch firs) in exposed stormy situations is less frequent. According to paragraph 29 of the forest law of Baden of the year 1879, no part of any forest is allowed to be kept uncultivated. The number of forest fires during the years 1879-1888 was 61, the damaged surface 99 acres, and the damages amounted to \$2,225. The principal causes of such fires are negligence, when burning down the skirts of the forest, or by throwing away matches or stubs of cigars. Very few cases of fires are caused by railroad locomotives.

The forest service ranks equally with other branches of the public service, and is comprised in Class D of the tariff of salaries. Seven members of the Administration of Domains (which forms a part of the Treasury Department) are the highest forest officers. They bear the title of Councillors of the Forest Board, and have a salary not exceeding \$1,380, and \$147 compensation for rent.

Besides the state forest there are community and corporation forests, covering a total surface of 555,069 acres, which are managed on the same principles as the state forests.

PRIVATE FORESTS.

The aggregate extent of the private forests is 451,670 acres. About one-third of all private forests is managed on forestry principles, including the forests of the Public Administration of Street, River and Railway Construction, and the most extensive and important private proprietors. The total forest product of the country increases gradually.

BAVARIA.

STATE FORESTS.

Bavaria, whose attractive capital, Munich, is frequented by so many Americans, has 6,000,000 inhabitants. Its state forests comprise 2,150,000 acres, and are mostly managed as "selection" forests. Large forests are to be found in all parts of the kingdom; but as a general rule the mountainous districts in the south (Alps), the north (Spessart) and northeast (Bohemian forest) are covered with the densest forest. Of the whole area of the country 33 per cent is covered with forest. The prevailing kind of trees, or 77 per cent, are coniferous. The remainder comprise various kinds of deciduous trees—those losing their foliage in winter. Among the conifers, red and white pine are most frequent. Among the deciduous trees the beech occupies the greatest space. The oak is also cultivated quite extensively for tanning purposes. The average estimated value of the forest land is \$50 per acre. The annual aggregate expense of administering the forests (1891) including salaries of officials, wages of workingmen, local taxation, new purchases, etc., amounts to \$4,965,204. The total revenue from the forests the same year amounted to \$8,187,349. Number of acres sown or planted to forests in 1892 was 14,800, more than three-fourths of which area was planted with coniferous trees. In the case of the red pine and the white pine, reforestation is mainly done in the natural way. In the case of the fir (*pinus sylvestris*) it is always effected artificially; in the case of the beech, always in a natural way (seed from standing trees); in the case of the oak, generally by artificial sowing. There is a continuity of forest products and a steady increase of the revenue which the state derives from its forests. This is due, first to an increase of prices, secondly to an increase of the yearly



Big Point Bay, Leech Lake, looking northeast. Photographed, September, 1900, for the Annual Report of the Chief Fire

crop. The latter must chiefly be regarded as a result of the present condition of the forests, which are being and have been steadily improved; also of the economy which was practiced in former times. Where reforestation is effected by seeding from the standing trees, the crop is generally cut in lengthy strips, usually not exceeding about thirty yards in width. As a general rule the administration of the state forests makes it a principle to avoid cutting in large blocks clean. In regard to compulsory tree planting, it may be said that every forest area, the trees of which have been cut, no matter whether state or private property, must be reforested in a short time, unless evidence can be furnished that the land would be better adapted to agricultural purposes.

The damage caused by forest fires is quite insignificant, being in 1890 only \$974, in 1894 only \$1,686. The principal cause of such fires is the carelessness of the workmen employed in the forests and of individuals and parties making excursions, particularly on Sundays. There are no data at hand as to the number of such fires caused by railroad locomotives, and although some fires are no doubt so caused, the number is certainly very small.

The administration of the Bavarian state forests constitutes one of the departments of the ministry of finance. It is directly subordinate and responsible to the latter, no other authorities intervening. The highest forest official who may be regarded as being at the head of the forest administration, responsible, of course, as stated, to the minister of finance, bears the title "Ministerialrath,"—ministerial or cabinet councilor. The chief director of the Bavarian administration of state forests is "Ministerialrath" Ganghofer. His starting salary is 7,740 marks. After a sixteen years' service the salary advances to 8,820 marks. Next in rank are the so-called "Oberforstrathe," with a starting salary of 6,660 marks, which, after a sixteen years' service, is increased to 7,740 marks.

PRIVATE FORESTS.

The aggregate extent of private forests was 3,149,400 acres in 1892. In addition to the state and private forests there are about 800,000 acres of forests belonging to separate towns and villages. The forests which are owned by great landholders are managed on forestry principles. These forests, however, only comprise a very limited area, somewhat less than 400,000 acres. Most of the private forests are the property of small landholders. The average value per acre of private forests is somewhat less than that of the state forests. The net income rate varies widely. The data at hand are too few and too unreliable to admit of arriving at any conclusion with regard to the average. Opinions vary as to whether the total forest product of the country increases or decreases. In general the extent of the private forests seems to be somewhat decreasing. This would, of course, also appear to entail a decrease of the total forest product. Forest lands are only allowed to be changed into agricultural lands when proof can be furnished that the agricultural crop may be expected to exceed in value the forest crop. Between 1886 and 1891 7,000 to 8,000 acres of private forests were newly planted or sown.

DENMARK.

STATE FORESTS.

The experience of a country which had adopted important forestry regulations almost at the very beginning of the last century and which has successfully, through tree planting, resisted the invasion of desolating sand drifts from the sea shore must prove of much value. It was, therefore, with a high degree of satisfaction that I lately received from the Department of Agriculture of

Denmark, answers kindly furnished in the English language to some questions that I had submitted. I have put the information in its present form.

The aggregate extent of the state forests of Denmark is 142,140 acres, besides 2,962 acres for public parks. Of these, 67,700 acres are old forests, 74,440 acres are new plantations, especially on heathy tracts. The planting of forests had already commenced one hundred years ago, but has quite particularly increased since 1850. Forty-five per cent of the state forests are situated on the Danish islands; 54 per cent on the peninsula of Jutland, of which latter only 10.6 per cent are old forests, the rest are new heath plantations not yet thoroughly planted up. Beech comprises 37.7 per cent, oak 3.3, ash, maple, birch, elm and alder 4.8 per cent, and conifers 54.2 per cent. Conifers did not exist in Denmark 150 years ago, so that the extensive area of conifers in the state forests at present has been produced artificially. For the planting up of heaths the mountain pine (*pinus montana*) and the spruce, (*picea excelsa*) are particularly utilized. The annual aggregate expense of administration averaged \$40,000 per year for the period 1893-97. Annual aggregate revenue averaged per year for the period 1893-97: revenue \$258,416, expenses \$195,370. The smallness of the net revenue arises partly from the fact that about half of the state forests are still so young as to yield only a small revenue, partly from extensive new areas being cultivated every year. The area annually sown or planted to forest averaged 2,285 acres per year for the period 1897-1900. Regeneration from self-sown seed is only used in the case of the beech (*fagus silvatica*) and of the silver fir (*abies pectinata*). In all other cases, forests are regenerated by means of planting plants or sowing seeds.

There is a sustained yield. Every tenth year a working plan is prepared for cuttings and cultivations of the next decennium. In working out these plans it is taken

into consideration, as far as may be, that there should be such areas and stocks of wood in store for the future as are available for the decennium. Within such a decennial period the yield of the cuttings varies according to circumstances; as a rule, however, there is but little differing one from the other. The extent of the state forests being on the increase, the proceeds will naturally increase. The forests are divided into parts of 10—100 acres in size, according to the nature of the soil or the species and age of the stock of wood. Within each decennial period a certain number of such divisions are destined for cutting, and the latter is commonly to be finished and the areas restocked with plants at the end of the period.

Private persons are prohibited by the law of September 27, 1805, from cutting away those remnants of the old forests of the country still existing in the said year. In cases of offence, means are placed in the hands of the government to force the owners to restock the cleared area under control of the state officer in charge. Consequently but very few forest areas have disappeared in the course of the nineteenth century. The many new plantations in Jutland which have risen by means of government subventions disbursed through the "Hedeselskabet," are subject to the same prohibition of clearing. Finally, under the guidance of a board of administration not appertaining to the state forestry service, the government has caused the waste sandy downs on the west coast of Jutland to be planted in order to subdue the sand drift in those parts, which had in former times caused great devastation. At the close of 1899 about 27,000 acres of sand downs had been planted with a good result. Damages by forest fires occur every year, but they have hitherto been rather insignificant. On account of the dense population of the country the casual forest fires are quickly quenched. The principal cause of such fires is care-

lessness of various kinds. It is notorious that several forest fires have been caused by sparks from locomotives, but no number can be stated.

The administration of the state forests is under the Department of Agriculture; its yearly budget is voted under the general budget of finances and its officers are appointed by the king. The state forestry is managed by three forest masters, twenty-three superior foresters, sixty-nine foresters and 306 keepers. The superior foresters have the use of a house free of charge, together with a lot of arable land (30-100 acres) upon which they pay the ordinary taxes, besides a salary of \$950-\$1,250. The salary of the forest masters is \$1,450, to which is added an allowance for traveling and other lawful expenses. The three forest masters give in an annual report on the operations of the local ranges under their supervision. Three reports are prepared in the department and printed in a condensed form as a supplement to the public accounts. Every tenth year is issued a review of the state forestry in the past decennium. The "Tidskrift Skovvasen" (forestry periodical), published in Copenhagen by Mr. C. V. Prytz, professor of forestry in the Royal Agricultural and Forestry Academy, and "Hedeselskabets Tidskrift" (periodical of the society for the cultivation of heaths), published by "Det danske Hedeselskab" at Aarhus, are the periodicals. The revision of the decennial working plans for state forestry, which is simultaneous with the preparation of the working plan for the next ten years, is undertaken by a "Skovtaxator" (appraiser of forests), classed directly under the department, and four assistant clerks. A second "Skovtaxator" with one clerk is constantly occupied in the experimental line, in examinations of the growth of trees and the economy of divers modes of forest husbanding, altogether in support of practical forestry.

PRIVATE FORESTS.

The aggregate extent of private forests is 505,900 acres, of which, by the statistics of 1896, beech (*fagus silvatica*) comprises 44 per cent; oak, ash, maple, birch and alder comprise 18 per cent, and spruce (*picea excelsa*), pine (*pinus sylvestris* and *montana*), silver fir (*abies pectinata*), larch (*larix Europea*), etc., 38 per cent. Three-fourths to four-fifths of these forests are managed on forestry principles. The extent of private forests by the official statistics was, in 1888, 414,837 acres, and, in 1896, 454,874 acres. By the law of September 27, 1805, before mentioned, and which is still in force, private persons are prohibited from cutting their parts of the old forests of the country standing at that time, aggregating at that date an area of about 280,000 acres. This area comprises (besides the old forest area of the state, about 100,000 acres) the remnants of the original forests of the country still existing. Since 1850 very considerable areas have been planted with forests, both by the state and by private persons, especially in the heathy tracts of the peninsula of Jutland. In these tracts an area of 108,500 acres has, since 1868, been planted by private persons, however under the guidance and control of the "Hedeslskab" (society for the cultivation of heaths), which is aided by the state (for the year 1900 to the extent of \$73,000); and of the above area 54,600 acres were thoroughly cultivated at the close of 1898.

FRANCE.

The total extent of the forests of France (exclusive of the colonies) is about 23,500,000 acres, which represents about 17 per cent of the surface of the entire territory.

These forests are divided in: Forests of the state, 2,700,000 acres; forests of the municipalities and of the public



institutions, 4,700,000 acres; forests of individuals, 16,100,000 acres. The forests of the state and those of the municipalities and of the public institutions are managed and supervised by the Administration of Forests. France only extends over 9 degrees in latitude, but, as it has very high chains of mountains, the result is that it possesses all the climates of Europe, from the hottest to the coldest, and that a great variety exists in the species of trees that compose the forests.

The principal varieties of these species are: In the warm region, comprising the borders of the Mediterranean sea and of the Gulf of Gascony, the cork oak (*quercus suber*), the evergreen oak (*quercus ilex*), the cluster pine (*pinus pinaster*) and the Aleppo pine (*pinus halepensis*).

In the temperate region, comprising the plains, the rolling grounds and the lower parts of the mountains, the common European oak (*quercus ruber*), the European white oak (*quercus pedunculata*), the beech (*fagus silvatica*), the hornbeam (*carpinus betulus*), the common European ash (*fraxinus excelsior*).

In the cold region, comprising the middle and upper parts of the mountains, up to the extreme limit of vegetation, the silver fir (*abies pectinata*), the Norway spruce fir (*abies excelsa*), the beech (*fagus silvatica*), the Scotch pine (*pinus sylvestris*), the mountain pine (*pinus montana*), the larch (*larix Europea*).

STATE FORESTS.

The total area of the forests of the state, 2,700,000 acres, is composed of 2,100,000 acres of productive forests and of 600,000 acres of protective forests, situated in the mountains or on the dunes of the ocean; of lands recently purchased by the state on the banks of torrents and whereon timber is now being planted.

The forests yield annually to the state:

Timber (cubic feet)	33,800,000
Fire wood (cubic feet)	62,300,000
Total	96,100,000

This represents nearly an annual production of 46 cubic feet of wood per acre of productive forest. The state forests produce in addition thereto oak bark, which is used in the tanning of leather; cork, rosin and several other small products; also hunting rights are leased.

The gross annual income in money is \$5,500,000, or \$2.62 per acre of producing forest. In some forests this average is largely exceeded and it attains as high as \$8 per acre.

The expenses are as follows, viz.:

Labor	\$1,240,000
Forest instruction	35,000
Sundry works	360,000
Reforestation of mountains	700,000
Taxes paid to departments and municipalities	360,000
Sundry expenses	60,000
Total	\$2,755,000

But of all these expenses a large share is applied either in administering the forests of the municipalities or in executing works of real public utility in the "protection forests," or in reforestation mountain lands (to prevent slides and the like). If we make these several deductions we find that the expenses incurred in the producing forests do not exceed \$1,500,000 or 71 cents per acre. The net annual income of these forests is therefore \$2.62 less 71 cents, equal to \$1.91 per acre.

The state forests are carried on either as high forest or as coppice, and are managed under regulations made by the President of the Republic. Cuttings are made yearly. In forests rich in wood there is cut every year an amount equal to the increment or growth; in forests poor in wood



they cut less than the increment in order to gradually increase the forest. The endeavor is made also to increase the production of the timber wood by reducing that of the fire wood. The "high tree forests" are cut down at periods ranging from 120 to 150 years.

The work is directed in a way that will insure natural reforestation from the seeds that fall from the standing trees. Not only the trees that have attained the age determined by the rules are cut down, but also the dead ones and those which are dying, and those that prevent the growth of neighboring trees. In temperate climate the annual cutting of high trees is on a limited area; a large number of trees are cut down simultaneously. In very cold climates and where winds are to be feared, only a few trees are taken away at a time on the same point, and cutting is then done on a larger area.

The low forest, coppice and second growth are cut in rotations, ranging from 25 to 35 years. The reserved trees, which are very numerous, are cut on an average every 100 years, but some selected trees are allowed to attain and even pass 200 years.

The labor performed in the forests consists in the construction and maintenance of forest roads, water saw-mills, houses for watchmen, replanting. Fortunately, owing to the system of culture now in use, artificial reforestation has but little importance in forests, properly speaking, but sowing and planting in the small open spaces, or on the points where a few more valuable species are to be introduced, or where the soil of the forest is better adapted to some varieties, there sowing and planting are more frequent. The average cost of such work is \$10.00 per acre.

Very considerable reforestation is made on mountain lands, where the state plants trees to regulate the action of the waters and stop the ravages of torrents. For that purpose \$700,000 are expended every year, the

largest part of which is used in the purchase of land, and the other part in dams to regulate the streams, and in plantations to settle and retain the soil. The state purchases yearly, on an average, 16,000 acres. The average cost of reforestation is \$20 per acre, and \$18 must be added thereto for work in improving the streams, building roads, etc. Planting is preferred to sowing on calcareous or chalky soil.

The administration of the forests forms part of the Department of Agriculture. It has charge not only of the direction and care of the forests of the state and of those belonging to municipal corporations and public institutions, but also the overseeing of the fishing in the rivers and creeks. At its head is a director, residing in Paris, who has under him: A central service composed of 3 administering general inspectors, 10 inspectors, 5 assistant inspectors and 17 clerks.

An exterior service composed of:

First—Personnel superior or of administration—32 forest keepers, 200 inspectors, 215 assistant inspectors, 250 general wardens.

Second—Personnel inferior or of surveillance—3,500 foremen and wardens, paid by the state; 3,700 foremen and wardens, paid by the municipal corporations and public institutions.

The annual salaries paid are as follows:

SUPERIOR OFFICIALS.

Director.....	\$3,000
Administrators.....	1,800 to 2,600
Forest keepers.....	1,600 to 2,400
Inspectors.....	800 to 1,200
Assistant inspectors	600 to 800
General wardens	300 to 520

Exclusive of some additional allowances for traveling expenses.

INFERIOR OFFICIALS.

Foremen and wardens paid by the state an average of ..	\$160.00
Foremen and wardens paid by the municipal corporations and public institutions	116.00

The foremen and wardens receive in addition thereto allowances of firewood, tillable land, pasture grounds, etc.

Those in the employment of the state have free rent in houses built in the forest, or in lieu thereof they receive as compensation a cash equivalent.

The superior officials are entitled to a retreat pension at the age of 60 years, and the inferior officials at the age of 55 years.

France has three forestry schools. One school of higher instruction at Nancy; one school of secondary instruction, and one school of primary instruction. The two latter schools are established in the department of Loiret, on the possessions of the administration at Barres.

FORESTS OF MUNICIPAL CORPORATIONS AND OF PUBLIC INSTITUTIONS.

The forests of municipal corporations and of public institutions comprise 4,700,000 acres. They are supervised by the Forest Service on the same conditions and according to the same principles as the state forests. They contain about 200,000 acres of forests for protection, and their producing area is thereby reduced to 4,500,000 acres. They produce annually, timber, 42,000,000 cubic feet; fire wood, 128,000,000 cubic feet, and together, 170,000,000 cubic feet. This represents nearly an annual production in wood of 38 cubic feet per acre of productive forest. The annual cash value of the product, including the bark, cork and rosin, is \$6,400,000, or \$1.42 gross income per acre. The net income is about \$1.14 per acre. The forests belonging to the municipalities and public institutions are under regulations approved by the president of the republic. These regulations and those of the state

forests have been established with a view of insuring a continuous annual production and even of increasing that production in the forests where it is not yet sufficient.

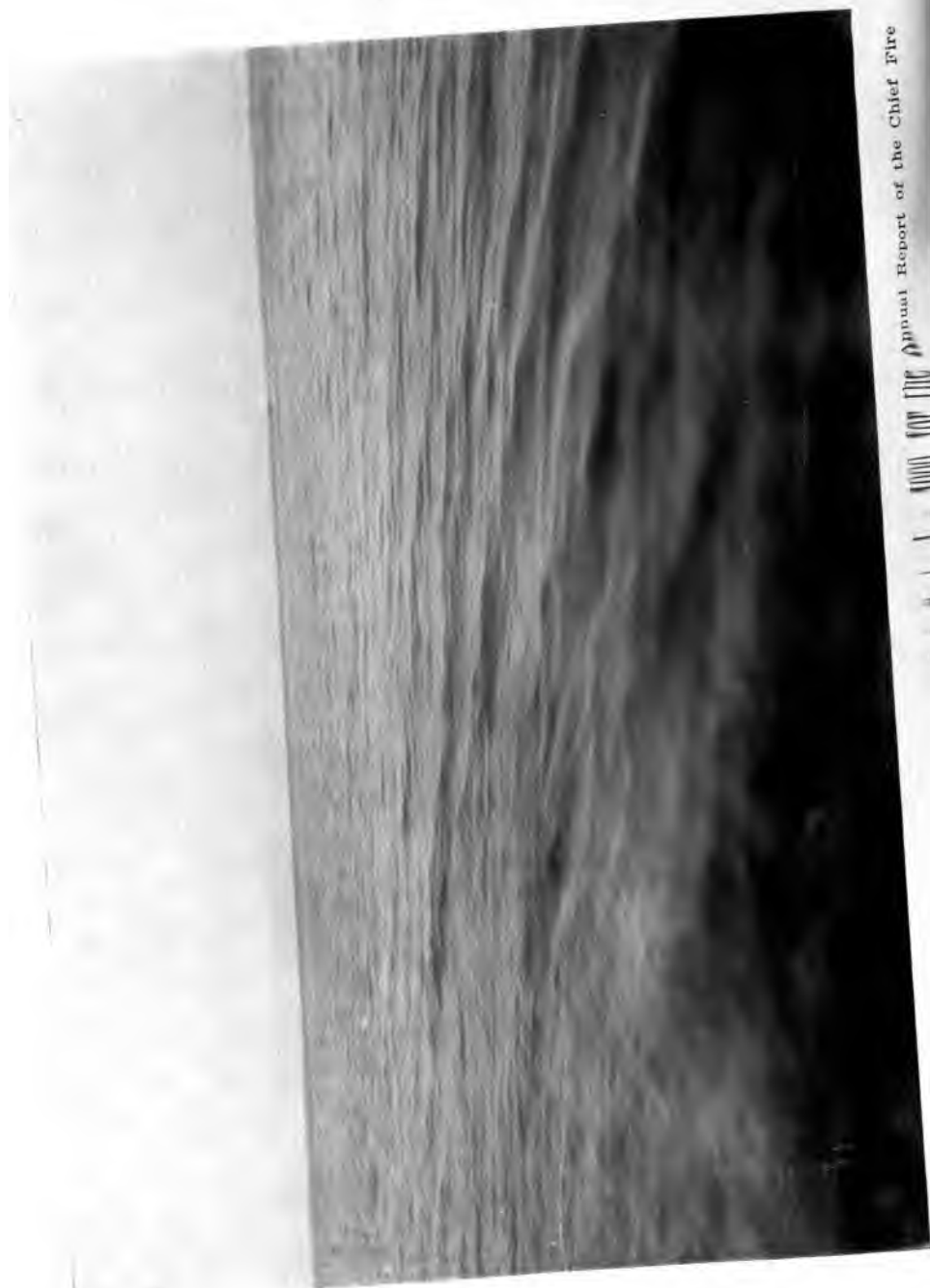
PRIVATE FORESTS.

Private individuals are at liberty to manage their forests as they please. But they are prohibited from cutting and taking trees from forests which are necessary to maintain and regulate water flow, to protect lands against the encroachments of the sea and sands, to defend the territory, or which are necessary for the public health. The destruction of private forests has become rarer and rarer and the proprietors acknowledge now that on soils of poor quality the income from forests is greater than that from arable land. As a result the area of private forests, instead of decreasing, increases from year to year by reason of the timbering of lands on which agriculture pays but small profits.

The income from private forests in quantity and in money is not exactly known. It is, however, known that on the same area they pay less than the state forests. Private individuals in their anxiety to get returns are inclined to cut down the wood when it is too young, and in the forests where coppice wood is raised they do not leave a sufficient reserve, and oftentimes leave none at all. One can notice, however, that the principles of silviculture are spreading more and more in the culture of private forests. The large forests are subjected to the same mode of management and are treated like the state or municipal forests. On the whole the annual production is regular and tends to become better in both quantity and quality.

FOREST FIRES.

In the temperate and in the cold regions of France (that is, in the larger portion of the territory) the fires are but few and cause slight damage. The long periods of



drought are not frequent, the numerous roads that run through the forests make very good lines of defense, and the villages that surround the massive wooded areas furnish at the first alarm devoted laborers. The railroad companies, being held responsible for damage by fire caused by flying sparks from their locomotives, take particular care, and in exposed places cut the grass and brush along their roadbeds.

The forestry code forbids, under penalty of \$4 to \$20, carrying or lighting matches in or within a distance of 200 metres from the forests.

In the forest camps of the state, municipal corporations or public institutions, it is forbidden to the workers to light fire outside of the buildings or shops, the location whereof is indicated by the forest service.

In the warm region the dangers from fires are greater. As a preventative against them more roads are built, trenches 20 to 50 metres wide and kept free from grass and brush are made around the forest, along railroad lines, on the dividing lines between forests belonging to several owners, and also from distance to distance in the large and dense forests belonging to the same proprietor. The use of fire in forest camps and in agricultural camps situated within 200 meters from the forests is forbidden during the months of June, July, August and September. A special watch is organized, and telegraphic lines penetrating the center of the forests admit of alarm of fire at its start and call for help. If the working force appears to be insufficient the military authority furnishes the deficiency and sends on the spot soldiers who act according to the directions of the forest service.

COLONIES.

France, fully convinced that the preservation of forests is in all lands of the highest importance, has organized a forest service in its possessions outside of Europe—in Al-

geria, Tunis, Madagascar, Indo-China, Reunion. In Algeria the organization is exactly similar to that of France, and calls for an annual expenditure for salaries and works of \$600,000.

HESSE-DARMSTADT.

STATE FORESTS.

The state forests of the Grand Duchy of Hesse-Darmstadt occupy 165,000 acres, and are situated in the Rhine valley (on alluvial sand), in the Vogelsberg mountains (on basalt and red sandstone), and in the Odenwald mountains (on granite, syenite and red sandstone). The prevailing species are beech, occupying 40 per cent, Scotch pine, occupying 34 per cent, and oak, occupying 16 per cent of the area under forest; whilst the remaining 10 per cent consist of spruce, fir, larch, alder and birch forest. It is a noteworthy fact, proved from the writings of Cæsar, Tacitus and of early German authors, that there were no coniferous trees present in their time except yew. Pine was introduced only from the 15th century on. The average value per acre is about \$100; but there are great differences according to quality of soil, transportation facilities and density of population. The annual aggregate expense of administration is \$148,500; and the annual aggregate revenue is \$561,000. There are planted annually to forest 750 acres, the planting extending over the entire surface of the ground. On 2,500 acres, according as "blanks" in natural regenerations are stocked, partial planting takes place. There are used on an average per annum: 110,000 pounds of seeds of broad leaved species; 4,000 pounds of seeds of coniferous species; 5,000,000 broad leaved seedlings; 5,000,000 coniferous seedlings. The annual expense for starting new generations of trees

aggregates \$22,000. Beech is invariably raised from the seed dropping from mother trees evenly distributed. Scotch pine is planted when one year old, over 10,000 seedlings being used for each acre. Spruce and fir are planted when four years old, or seeds are sown in strips being about four feet apart. Oak is either planted as a seedling two feet to three feet high, or acorns are dibbed in, the method used depending on local conditions. All plants are raised in forest nurseries, kept under the care of local forest rangers. Comparatively large areas are covered with oak-coppice forest, which is copped every 15 to 20 years, with a view of obtaining tanning bark. White pine and douglas fir have been introduced with splendid success. American red oak and hickory seem to answer the local conditions fairly well.

In certain densely populated sections, where soil fit for agriculture is scarce, field crops (potatoes and rye) are raised together with tree crops during the first three to five years following the cutting of mature trees. Rows of potatoes alternating with rows of pine seedlings are frequently seen. This combination reduces the expense of reforestation. It secures for the seedlings a soil of high porosity, whilst it exhausts, on the other hand, the mineral contents of the ground and the accumulated layer of humus.

Reforestation is effected on about 40 per cent of area by seed from standing trees; on about 10 per cent of area by coppicing and on about 50 per cent of area by artificial sowing and planting. The annual yield is strictly sustained. The yield per acre per annum is 74 cubic feet, of which not less than 60 cubic feet is used as fuel. The value of cordwood piled up along forest roads is about \$2.50 per cord. The value of logs cut and hauled to forest roads is about \$11.25 per 1,000 feet board measure. As to the usual method of cutting a crop, about 30 per cent of the yield is made up of stuff obtained from thin-

nings. The remaining 70 per cent consists of mature trees. Wherever regeneration is effected from self-sown seed, the mature trees are gradually removed. Where planting is resorted to, a clean sweep is made of all mature trees over areas aggregating about 25 acres on an average. Large clearings are considered a mistake, as it is difficult to restock them.

With regard to compulsory reforestation the following may be said: Private forests must be planted up within three years after the removal of a mature crop. Exemptions from this rule may be granted, upon application, by the State Forestry Bureau. Waste land planted up by the owner is, once for all, exempted. If a forest owner hesitates to replant his clearings within three years after the cutting of the trees, he is subject to a fine. The forest authorities will replant the clearing at the owners' expense, the owner being allowed the choice of species. Any treatment of forests likely to result in permanent unfitness for the production of timber, is prohibited.

Little damage is done, generally speaking, by forest fires. On the average annually 54 fires are reported, running over 45 acres altogether, and resulting in an annual loss of \$533. In 28 cases out of 272 cases the forests were so badly damaged that it was considered wise to cut the trees and replant the area thus cleared. The principal cause of forest fires is carelessness of smokers. A few only of such fires are annually caused by railroad locomotives, perhaps three annually.

The rank of the forest officer corresponds entirely with the rank of officials in other branches of the public service. The average salary per year of the "Oberforstrat" is \$1,300, of the "Oberforstmeister" \$1,125, of the "Oberforster" \$825, and the office and transportation expenses of the last two named are \$350 and \$200 respectively. No official report is published, either annually or periodically.



PRIVATE FORESTS.

The extent of private forests is as follows: Communal forests, administered by state foresters, 235,000 acres; entailed forests, owned by families, 132,000 acres; ordinary private forests, owned by individuals, 70,000 acres; total, 437,000. All communal forests and all entailed forests are managed on forestry principles, furnishing a sustained yield. The condition of the ordinary private forests is deteriorating, as the productiveness of the soil is abused by pasture, removal of litter and incomplete density of leaf canopy. Communal and entailed forests are worth as much as state forests, namely, about \$100 per acre. The value of private forests owned by individuals is considerably less. The average rate of net income is about 2½ per cent. The total product of the country is well sustained.

Considerable sums are derived in state and communal forests from hunting and fishing leases. The foresters of all grades enforce, *ex-officio*, all fish and game laws. The subaltern foresters, as a general rule, are taken from the army.

The wages of the common laborer average about 50 cents per day. In the mountainous sections wood fuel is cheaper than coal. In the state forests \$24,700 are annually spent for new roads, or for macadamizing old roads. The state oberforster is at the same time the manager of all municipal or village forests lying within his district. The sale of forest produce, however, is done by the mayors of towns and villages. A splendid system of well graded public roads, covered with stone in the Telford system and maintained at an annual expense of \$270 per mile, facilitates economic forestry to a very high degree.

ITALY.

STATE FORESTS.

It was a peculiar pleasure to receive, as I lately did, from the Ministry of Agriculture at Rome, an account of the forestry of Italy, that beautiful country which dates back thousands of years and whose woods have been sung by Horace and Virgil. The aggregate area of the state forests is 128,960 acres, principally situated in Tuscany—provinces of Florence, Arezzo, Grosseto, Pisa and Leghorn; and Venice—provinces of Belluno, Treviso and Udine. These lands are regarded as inalienable. The prevailing kinds of trees are oak, beech, pine, larch and fir. The total annual expense of administration averages about \$80,000. The annual sale of the raw material from the state forests averages \$150,000. The number of acres annually reforested with trees is 150. The method of reforesting varies according to the different species of trees and the local conditions; but seeding, whether artificially or naturally, is used only for the oak and the beech. For other kinds, such as the fir, pine, larch and chestnut, reforesting is done by planting. Generally good care is taken to maintain a sustained yield. In regard to cutting, the practice is to cut only those trees which have reached fiscal maturity and those that are dead or about to die.

The damage caused by forest fires amounts to about \$80,000 a year. The causes are principally accidental. Only a very small number of forest fires are caused by railway locomotives. The forest service has much importance in the protection of mountainous land and in the control of water. The annual salary of the chief inspector of the forests of the first class is 6,000 lire; that of the chief inspector of forests of the second class, 5,000 lire; that of inspector of forests of first class, 4,000 lire



Red Cedar Point, Leech Lake; looking east. Photographed, September, 1900, for the Annual Report of the Chief Fire Warden of Minnesota.

The Minister of Agriculture generally publishes a detailed report on the administration of the forests every five or six years.

NORWAY.

STATE FORESTS.

The extent of the state and semi-public forests of Norway is 2,587,500 acres. Of these, 837,500 acres are located in the provinces of Tromso and Finmark; 140,000 in that of Norrland; 285,000 in North Drontheim, and 225,000 acres in South Drontheim and Romsdal, and about 397,500 acres in Hedemarken. The prevailing kind of trees are pine (*pinus sylvestris* L.), spruce (*Abies excelsa* D. C.), and two species of birch. The average estimated value of the forest land is \$2.70 an acre. The annual aggregate expense of administration is about \$108,000, and the annual aggregate revenue varies from \$60,000 to \$67,500. The number of acres annually sown or planted to forest varies from 150 to 175 acres. Reforestation is almost entirely effected by natural seeding from standing trees, and, when artificial culture is employed, by planting trees. The crop of forest production is periodical, and depends partly on the market prices of lumber. The forest administration tries to prevent the yearly average yield exceeding the net increase of the forest. Cutting must in part depend on the demand. Where it does not pay to cut smaller trees, the mature ones are principally cut, while at the same time, as far as possible, diseased and injured trees, as well as such as would hinder in the growth, are removed. Where, on the other hand, trees of smaller size can be profitably sold, small blocks are cut clean in order better to promote new growth.

The law of July 20, 1893, on the preservation of "Protecting Forests" and against the destruction of forests, has special provisions relating to "Protecting Forests," by which are meant forests serving as a protection against snow avalanches, stone slips, alteration of river beds, shifting sand, or as a special protection to other forests or to inhabited country. "Protecting Forests" are also such as bound districts and mountain forests, which, from their situation on the slopes of high mountains or in the neighborhood of the sea, or in the far north, grow so slow that they would die out if neglected. Under "Protecting Forest Lands" are also included bare fields, to be planted in the future to serve as other "protecting forests." The municipal council selects three men, who, after consulting the public forest officer, propose the localities within the district to be considered as "protecting forests." The municipal council has then to fix the boundaries of the forests, and on the proposition of the forest inspector of the district to determine the rules for its management. These regulations must have the sanction of the king to be valid. The municipal council can also make reservations, subject to the king's approval, against the destruction of the forests in general. Such municipal regulations relating to "protecting forests" and forests in general may probably also include compulsory regulations as to planting and sowing of forests already cut down. No other laws relating to forest culture exist in Norway.

The damage caused by fires in the public forests is inconsiderable. Many years there is none; and the damage done to private forests is of small account and unreported. The principal cause or causes of such fires is carelessness of owners, fishermen, cowherds, etc., as well as the burning of heather for cultivation of the land. The law of July 14, 1893, on "Fires in Forest and Fields," with the supplemental law of July 27, 1896, has provisions relating to the prevention and extinction of forest fires.

The central administration of the forests is directly under the department of the interior, without intermediate officers. The service is under the charge of the chief (the director of the forests), and there are 4 forest inspectors, 25 forest officers, 1 forest engineer, 2 assistants, 7 forest planters and 363 forest guards. The yearly salary of the chief (the director) is \$1,450, without additions. The inspector's salary is \$800, increasing up to \$970. The forest officers, \$480, increasing to \$800. All these functionaries have their traveling expenses paid when traveling in the service of the state. The officers and the inspectors hand in every year a report to the director, who publishes a report on forest matters generally every third year. The only forest periodical in Norway at present is the "Tidsskrift for Skovbrug," (Periodical for Forestry), published by the Norwegian Association for Forestry.

PRIVATE FORESTS.

The aggregate extent of private forests is 18,000,000 acres, of which about 276,000 acres are managed on forestry principles. The average value per acre is from \$4.28 to \$5.36, and the average annual rate of net income is from 55 to 60 cents per acre. The cutting undoubtedly exceeds the natural increase of the forests. The supply of wood is consequently decreasing, and the size of the trees decreases. The government purchases annually forests to the amount in value of \$21,440. It has three large and several smaller nurseries. These supply the required number of plants to the public and to private parties. It has also four seed establishments, which supply the public and private demand for tree seeds. It also has two elementary schools of forestry, and it tries through its functionaries to instruct forest owners in rational management of the forests.

PRUSSIA.

STATE FORESTS.

The extent of the state forests of Prussia is 6,955,227 acres. Included in this, however, are 715,637 acres not designed for tree culture. In addition, the extent of forests belonging to municipalities is 2,563,812 acres; belonging to churches, 207,752 acres; belonging to corporations, 555,900 acres; private forests, 10,828,730 acres; making an aggregate extent of 21,111,421 acres in the whole kingdom.

The prevailing kinds of trees in the state forests are Scotch pine, larch, beech, red pine, fir and oak. The value of the land varies so much, rising from a small amount to \$700 per acre, that it is impossible to give an average estimated value. The annual aggregate expense of administration (state forests) is as follows: The office expenses and maintenance, including expense for education in forestry, etc., averaged in the years 1893 to 1897, per annum, \$8,500,000. The annual aggregate revenue in the years 1893 to 1897 amounted to \$17,200,000, being at the net rate of \$1.50 per acre of actual forest. The number of acres sown or planted with forest annually during the years 1893 to 1895 was 44,830.

The foresting of the beech is mostly effected from standing trees, though artificial sowing and planting are also done. The oak is either reforested by seed from standing trees, or artificially through sowing or by planting. The Scotch pine is first cut clean and reforested by sowing or planting, and the red pine the same. Sowing from standing trees is not common. In regard to the continuity of forests products, the forestry department endeavors to obtain the highest possible continuous net income. The usual method of cutting is in blocks clean.

Under the head of compulsory tree planting the following laws are referred to: The Forest Protection Law of

July 6th, 1875; the law of August 4th, 1876, concerning the administration of forests owned by municipalities and public institutions in the provinces of Prussia, Brandenburg, Pomerania, Posen, Silesia and Saxony.

The average annual damage caused by forest fires in the years 1892 to 1896 was as follows: Totally or mostly destroyed, 2,992 acres; only slightly damaged, 117 acres; only the surface destroyed, 522 acres. The average annual number of forest fires in the years 1892 to 1896 was 36, the causes of which were as follows: 12 unknown, 2 railroads, 5 incendiary, 16 caused by carelessness, 1 lightning. During the years 1892 to 1896 the annual average number of forest fires caused by railroad locomotives was 2.

The officers in the forest service are equal in rank to the other high grade officers in the government service. The foresters have clerical rank. The salary of "Oberforster" (district manager) ranges according to length of service from 2,700 to 5,700 marks. Unfavorably situated officers receive an additional amount, the maximum of which is 600 marks annually. In addition there is usually free residence and fuel. The salary of the "Oberforstmeister" (chief inspector) is from 4,200 to 7,200 marks, according to length of service, which is calculated from the time of qualification for the office of "Forstrath" (councillor). The "Oberforstmeister" and "Forstrath" are each allowed an amount not exceeding 2,900 marks for traveling expenses.

PRIVATE FORESTS.

The extent of private forests in Prussia, as above stated, is 10,828,780 acres. About one-half of these forests are managed on forestry principles, and their average value is somewhat less per acre than that of the state forest. On the larger estates the area devoted to forests gradually

increases, while on the smaller estates the forest area probably decreases.

Some of the forests of Prussia are attractive resorts for travelers, and especially pedestrians, who enjoy the excellent roads. Of the celebrated Thuringian chain, which is 70 miles in length by from 8 to 25 miles in breadth, a writer says: "The successive hills melt into each other in gentle undulations, forming a continuous and easily traced comb, and only the northwest slopes are precipitous, and seamed with winding gorges. This mountain range incloses many charming and romantic valleys and glens; the most prominent feature of its picturesque scenery is formed by the fine forests, chiefly of pines and firs, which clothe most of the hills."

Prussia comprises nearly two-thirds of the entire extent of the German Empire, yet its area lacks considerable of being twice that of Minnesota. Thirty-one per cent of its soil is predominantly sandy, and on the whole probably is not as good as that of Minnesota; yet it sustains a population twenty-five times as large as that of Minnesota. This fact might well find a lodgment in the minds of our statesmen, that whereas Prussia annually derives a net revenue of \$1.33 an acre from her 6,000,000 acres of state forest, our state, from about an equal area of land in its borders, adapted to forest, derives no regular net revenue at all.

DUCHY OF SAX-MEININGEN.

The area of state forests is 106,530 acres; of communal forests, 84,460 acres; of private forests, 71,850 acres; miscellaneous, 1,480 acres; in the aggregate, 264,310 acres, being equal to 42.4 per cent of the total area of the state. The state forests comprise 24 units of ad-



Opposite Squaw Point, Leech Lake, looking south. Photographed, September, 1900, for the *Annual Report* of the Chief
Fire Warden of Minnesota.

ministration, in charge of 24 superior forest officers. The highest functionary in forestry matters is the president of the forestry bureau. The bureau is composed of five forest counsellors, two of whom act as forest inspectors at the same time, each one supervising 12 of the above named 24 forest officers. The annual yield of the state forests is 5,779,669 cubic feet of lumber and fire-wood cut in ripe forests, and 1,288,904 cubic feet of fire-wood and pulp-wood obtained from thinnings. These figures correspond with an annual yield of about 155 feet board measure of lumber plus 0.40 cords of fire-wood per acre per annum. The state forest officers at the same time control the management of the communal and private forests within the state. All grades of forest officers have certain police duties concerning forests, fish and game preservation.

The municipalities owning forests are required to appoint well trained foresters for the management of their forest realties.

SAXONY.

STATE FOREST.

The aggregate area of the state forest is 432,000 acres. The forests are scattered over the Erz mountains themselves and over their outskirts. They are further situated in a few smaller and separate mountain ranges and in the plains. The altitude at which the state forests are found ranges from 100 to 1,200 meters, or from 328.1 feet to 3,937.2 feet, above sea level. The first group of forests, in the Erz mountains, is pretty compact and comprises 200,000 acres. The second group, in the outskirts of the Erz mountains and in some smaller distinct mountain ranges, comprises 136,000 acres; and the third group, in

the plains, comprises 96,000 acres. The soil consists of decomposed granite, granulite, gneis, mica-slate, clay-slate, grauwacke, porphyry, sandstone and some basalt. In the plains there is diluvium and alluvium. Only a very small portion of the forest area might be deemed fit for agricultural use.

The principal tree species are spruce, *picea excelsa* (Link); Scotch pine, *pinus silvestris* (L.); silver fir, *abies pectinata* (D. C.); larch, *larix europæ* (D. C.); roth-buche, *fagus silvatica* (L); oaks, *quercus pedunculata* (Ehrh.), and *qu. sessiliflora* (Sm.); hornbeam, *carpinus betulus* (L.); ash, *fraxinus* (L.); several maples, namely: *acer pseudoplatanus* (L), *A. platanoides* (L); further, several species of elm, *ulmus*; of birch, *betula*; and of linden, *tilia*. The prevailing species is spruce.

The value of the state forests, including timber and soil, aggregates \$76,490,000. Hence the value per acre is \$177. The annual expenses for administration for the year 1896 were \$1,040,000. In the year 1896 the annual gross revenue amounted to \$2,986,000; the annual net revenue to \$1,946,000.

The entire area planted annually varies according to circumstances. On the average it will reach 6,900 acres. Of these 6,900 acres 800 acres are planted up with seeds and 6,100 acres are planted up with plants. About 20 per cent of the above figure 6,900, or 1,380 acres, consist of blanks in plantations previously made where the original planting has failed. Thus it appears that the area planted for the first time after the removal of the old crop is only 5,520 acres. The question whether plants or seeds shall be employed for restocking cleared ground depends on the condition of the soil. As a general rule, seeds are planted only on such areas which do not produce grass and weeds to a large extent and which at the same time are of sufficient fertility and well protected against late frost. The sowing or planting of seeds must



be done not later than in the second year after the final removal of the former tree crop. Strips about three feet wide or places about six feet square are cultivated with a spade before the seed is thrown on them. Only in rare cases the entire area to be planted with seeds is ploughed and harrowed and the seeds spread over it broadcast. The plants used for planting up a clearing are as a rule two years old or older. The age of the plants selected depends on the condition of the area to be planted aside from depending on the species itself. Spruce, Scotch pine, fir and larch or tamarack, as a general rule, are used two to five years old; beech, oak, ash and maple, as a general rule, are used three to six years old. The plants are raised in nurseries. Only in rare cases they are taken from areas previously planted with seed in the open forest. The number of plants used per acre ranges between 600 and 4,000, according to the species, the size of the plants used and the condition of the area to be planted.

Regeneration from self-sown seed is only used in the case of the beech (*Fagus silvatica*). In all other cases forests are regenerated by means of planting plants or sowing seeds.

There is no law or rule in Saxony for compulsory reforestation after clearings.

There is not much damage done by forest fires. It averages \$300 per year. Forest fires of a larger extent have happened very rarely. As a rule, forest fires are caused by the careless use of matches by tobacco and cigar smokers. Very few fires are caused by sparks from locomotives; on the average perhaps three per year.

The yield or annual cut is fixed by working plans prepared for periods of ten years and renewed after the lapse of such periods. Within these periods the annual yield is almost constant. At the end of a period, however, a new working plan might provide for either a higher or

lesser yield. It is an iron-clad rule that on the whole the cut shall not exceed the increment of the forest.

Trees are cut as low down as possible above the surface of the soil; the instrument used is the saw. The stump and the root are dug out afterwards wherever such work is remunerative, viz., where the wood obtained can be sold at a paying rate. In Saxony regular forest management began with the beginning of the century in a systematic way; consequently the forests now existing are almost even aged and composed of trees of almost even size; hence there is no objection to clearing an entire area of given size, say of two or three acres, at once, removing from it every tree standing on it. In exceptional cases, pieces of forest not entirely mature may be sacrificed with a view of saving others from the dangers threatening from storms and insects.

The average age of maturity in Saxony for conifers (spruce) is eighty to ninety years. However, there are cases in which this rule is not adhered to. The size of trees when fit for the axe depends entirely on the species, on the condition of the locality, the means of transportation, etc. Previous to the final cutting, and beginning with the twenty-fifth year of a piece of forest, and ending at the sixtieth year of the forest, thinnings take place at intervals of about ten years with a view to allow increased light and increased space to the most promising specimens of the growing stock. Specimens growing less vigorously, dying or dead, are removed at the same time wherever it pays.

There is no difference in the rank of the forest officer compared to that of any other state officers employed in the technical branches of the government. The state forestry service is divided into a lower and higher branch. The professional training for the first one is a merely practical training, whilst the latter necessitates scientific preparation of a high class. The requirements with reference

to this scientific preparation are as follows: Graduating from a state gymnasium; six months of practical instruction under a forest officer on one of the state forest ranges; twelve months' study at a university; two and a half years' study at the forest academy at Tharandt, at which two examinations must be passed; three years of practical professional training under a forest officer and at the bureau of forest working plans at Dresden; examination by the state authorities. After this preparation, as soon as there is a vacancy, appointment as government officer might follow, to begin with as assistant of an Oberförster (Superior Forester); then as superior forester, and so on up to the higher ranks of chief of a forest territory or chief of the bureau of forest working plans. The latter officers have the title of "Superior Forest Master." The highest technical authority controlling the local and territorial officers is called "State Forest Master." There are 108 local ranges in Saxony allotted to 11 territorial districts. The former are in charge of a superior forester (Oberförster), the latter in charge of a superior forest master. The central bureau of the entire state forestry service is under the Secretary of Finances.

The salary of a superior forest officer averages \$1,015 (from \$1,150 to \$1,180), to which must be added an allowance of \$566 for traveling expenses, horse keeping and the use of a house free of rental. The salary of the Superior forest master averages \$1,486, ranging from \$1,274 to \$1,698, to which must be added a traveling allowance of \$708 and the use of a house free of charge.

In the case of physical disability the forest officers draw a pension depending on the duration of their state service and on the salary received so far. This pension is at least 30 per cent of the salary. In no case does it amount to over 80 per cent. The latter figure is paid after thirty-nine years or more of state forestry service. At the age

of sixty-five years the state forestry officer is entitled to a pension in case he desires to retire, even if his constitution would enable him to continue in the service.

No annual report of the Saxony forest administration is published.

"Das Tharandter Jahrbuch" is considered the best periodical on forestry.

As further information, it may be stated that the administration of a forest range, by the superior forester under the supervision of the superior forest master, is outlined by "the working plan" which is prepared by the bureau of forest working plans at Dresden, containing prescriptions for a period of ten years. The superior forest officer co-operates in the preparation of this working plan, which has to be submitted to the secretary of finances. The preparation of a working plan is based on a thorough knowledge and a thorough scrutinizing of the conditions of the forest range, which often takes several months. The forest working plan contains a statement showing the areas of the different compartments or units of the forest range; it contains a description of these compartments and maps of the same; all sections of the forests are examined with reference to their increment. All these investigations made, the forests or sections of forests to be cut during the next decade of years are selected and pointed out specifically. Further, there is stated specifically what compartments or sub-compartments are to be thinned out, what areas are to be planted up, and by what means regeneration is to be effected in each single case. Deviations from the prescriptions of a forest working plan must not be made unless authorized by the secretary of finances. Every working plan is controlled by the state forest master in the range itself. Besides, in the midst of the ten years period, or after the lapse of five years, such a control by the highest forest officer of the state takes place, so as to find out whether and in how



White pine on the south shore of Cass Lake. Some of Minnesota's most charming scenery.
Photographed, 1899, for the Annual Report of the Chief Fire Warden of Minnesota.

far the prescriptions of the working plan have been followed and whether deviations might be advisable.

The sale of the forest produce (timber, fuel, bark, stones, etc.) is done by the superior forest officer with the help of a local state cashier, who is holding an office absolutely independent from the forestry service and is directly subordinate to the secretary of finances. This arrangement makes embezzlements practically impossible. The sale of timber and fuel takes place, after they are cut and piled up, by means of public auction. The cutting and piling of timber and fuel is done by common hands working under a contract. Any planting, on the other hand, is done by day workers, under the supervision of the local rangers, so as to warrant careful work.

PRIVATE FORESTS.

According to a statement made for the year 1893, the total area of the private forests in Saxony is 539,000 acres. All forests owned by municipalities and villages and other corporations, and a considerable fraction of the larger private forests, are managed according to true forestry principles. All administrations of municipal, town and village forests are controlled by the state. The working plans for these forests are prepared by the bureau of forest working plans at Dresden. In these cases, the forest working plan is approved of by the secretary of the interior, and not by the secretary of finances, as would be the case for state forests.

It is impossible to give any data as to the average value per acre of communal and private forests. Neither are data available as to their average annual yield. Generally speaking, the yield of private and communal forests is considered to be lower than from state forests. Wherever there are working plans the cut is steady, and even during the period over which the working plan extends.

Where there are no working plans, the cut depends entirely on the pleasure of the owner.

Small holdings of forests, especially those of the peasantry, are deteriorating. Parts of such forests are changed into fields or meadows; other sections are purchased by the state, communities or wealthy private individuals.

GRAND DUCHY OF SAX-WEIMAR.

The area of state forests is 110,910 acres, of private forests 120,510 acres, in the aggregate 231,420 acres, being equal to 25.6 per cent of the total area of the state. The state forests comprise 37 units of administration, in charge of 37 superior forest officers, trained at the forest academy of Eisenach.

The control of the local forest administration is effected through six forest inspectors, the highest authority in forestry matters being represented by a forestry bureau, attached to the office of the secretary of finances. Forest working plans are prepared and their execution controlled by the "Commission of Forest Working Plans," at Eisenach, the director of the forest academy being at the same time chief of that commission. The annual yield of the state is 5,864,177 cubic feet of lumber and fire-wood, corresponding with about 125 feet board measure timber plus 0.31 cords fire-wood per acre per annum.

The main duties of the superior forest officers consist of: Care of the property; maintenance of boundary lines; preventing the acquisition of prescriptive rights to pasture, litter wood, etc., by outsiders, and preventing forest offenses; maintenance of the growing stock of timber; forest utilization and forest regeneration, as prescribed by the working plans; sale of forest produce and control of the book-keeping.



SWEDEN.

STATE FORESTS.

The aggregate extent of the state forests of Sweden in 1895 was 18,080,753 acres. The area of state forests is annually increasing by extensive purchases of private forest. The prevailing kinds of trees are spruce (fir), pine and birch. The estimated value of the state forests is \$4 per acre. The figures in this statement are for the year 1895, in which the aggregate expense of forest administration was \$185,397, and the aggregate revenue was \$1,126,636. The number of acres sown or planted to forest was 10,875. The number of acres damaged by fire was 1,200, and the amount of damage was about \$10,000. Neglected camp fires and carelessness when burning fields for cultivation are the principal causes. Only three fires were caused by railroad locomotives. The state forests are divided into 9 districts and 74 ranges ("revir"). The chief of a district is an officer entitled "Öfverjägästare," with annual salary of \$1,707 and rank corresponding to the rank of major in the army; the chief of a range ("revir") is an officer entitled "Jägästare," with a salary of \$1,200 and rank corresponding to that of captain in the army. Before any one can be appointed as "Jägästare" he must have passed successfully the examinations required after a year's attendance at one of the forest schools, the examinations required during a two years' course at the College of Forestry at Stockholm, and must have practiced forestry a year on a range. Foresters or guards receive a salary of \$160. The state provides dwellings in the vicinity of the forests for officers and foresters. At the head of the forest administration is a director general, with salary of \$2,400, and having rank corresponding to that of a major general in the army;

and a chief of bureau, with salary of \$1,867 and rank corresponding to that of a lieutenant colonel in the army.

There is a continuity of forest product based upon certain plans of cultivation. Reforesting is effected partly by sowing, partly by planting, but principally by seeds from standing trees, assisted by planting. The usual method of harvesting the forest crop is, in the southern part of the country, by cutting in blocks clean; in other parts of the country by cutting trees only down to a certain size fixed by law. The total forest product of the country is sustained, and it is increasing.

PRIVATE FORESTS.

The aggregate extent of private forests is 58,715,123 acres and their average value per acre is estimated at about \$5. About twenty-five per cent of private forests is managed on forestry principles. A royal committee is preparing a project of forest laws to promote re-growth of private forests.

FORESTS OF THE UDDEHOLM COMPANY, SWEDEN.*

The forests of the Uddeholm Stock Company are situated in nine parishes in the province of Vermland and in two parishes of the province of Dalarne. Karlstad, on Lake Wenern, about fifty (English) miles distant, and Gothenberg, about one hundred and eighty miles distant, are the nearest export harbors. Lake Wenern is connected with the Baltic and also the North Sea by the Gotha and Trollhatte (canals). The company owns fifty-six miles of railroad—Nordmark-Klarelfven—with thirteen stations, which transports all sorts of goods, especially iron and lumber, to and between the works. The company owns 400,000 acres of land in Vermland and 25,000

*Information furnished in Swedish by Dr. Fredrik Loven, chief forest master, through Mr. Gust. Jansson, manager of the Munkfors Iron Works.



Photomontage of Cane Lake.

acres in Dalarne. About 60,000 acres have been acquired within the last ten years. Of the entire area, not exceeding 60,000 acres consist of naked tracts, fields, meadow, also unproductive surface of moss, lake and rocky elevations; while at least about 375,000 acres consist of natural forest-bearing land. Hereof perhaps 15,000 to 18,000 acres are pasture land. Pine comprises 70 per cent of the forest, and spruce 30 per cent of all trees large enough for the saw. The birch is the prevailing species within the pasture, but among the birch conifers are generally found.

The Uddeholm Company's lands lie on both sides of the Klar river along its middle course. The parish of Råmen, in Vermland, and the boundary of Dalarne terminate the extent of the property on the east and the two judicial districts of Fryksdal on the west. About 375,000 acres lie in one body. Only a very little public forest and some belonging to farmers are included therein here and there. The rocky elevations consist of primary rocks, principally granite and gneiss, with interspersed hills of hyperite. West of the Klar river red iron gneiss is almost the prevailing rock, but east of the same river granite prevails, in large part solid, not crystalline, but there are large tracts of primary granite poor in feldspar. On granite, pine prevails to the extent of 75 to 80 per cent, while on gneiss spruce occupies at least 40 per cent of the surface. On the "hyperite" hills spruce of large growth prevails. The soil in the forest is composed partly of the disintegrated rock such as above mentioned and partly of deposits of older or later water courses. Much of the soil is gravelly; much also is sandy. The Klar river within the region of the Uddeholm forest is 400 feet above the sea, and on the east and west sides rise very steep hills which at a distance, generally of a thousand yards, attain a height of from 1,000 to 1,500

feet above the sea; thereafter they take a plateau form but are very often broken by water courses or bogs. The whole region is thereby in a large degree of that cut and broken character which one can readily obtain an illustration of by ascending one of the principal heights. The highest and only actually barren-topped mountain in the company's forest is Harfjellet, 2,200 feet above the sea. Another, Tönnet mountain, 1,700 feet above the sea, called a "fjell" (barren-topped or snow-covered mountain), but it is not actually that, for it is partly forest covered.

Agriculture takes a subordinate place; the land most suitable for cultivation is generally along the banks of the larger streams. About 700 persons occupy small farms as tenants and are obliged to produce certain quantities of charcoal, in general 6,600 bushels each, and in all 4,620,000 bushels. They are also obliged to transport the coal to the works. Besides, there are several hundred forest laborers with smaller premises on which one or two cows and several smaller animals are fed. About 14,000 persons live and gain their livelihood on the company's property.

About 3,000 acres (2,700 to 3,000 "tunnland"; one tunnland being equal to 1.22 acres) are consumed or cut over annually; though it is not easy to say just how much, because clean cutting and selection cutting (cutting only the larger trees) are both practiced. On an average every tunnland (1.22 acres) ought at the end of every rotation period—120 years for pine and 90 years for spruce—yield from 4,000 to 4,500 cubic feet of lumber.

The forest is handled by means of cutting trees that hinder the growth of others or which are themselves defective ("hjelp och rensningsgallringar"), and thinning to admit light ("ljushuggningar"), consisting of two to three careful timber cuttings with an interval of 15 to 20 years.

which end either by leaving seed trees or in clean cutting. The best stands of pine are finally cut at the age of from 130 to 140 years, and the middling at the age of 120 years, and the poorer at the age of 100 years. The spruce stands in which thinning is much practiced are nevertheless very sensitive to damage from excess of light, wherefore timber cutting must be undertaken with great care and skill, otherwise drought occurs. Spruce is cut at the age of 70 to 100 years, according to its quality. During the past ten years there has been cut yearly 12,000,000 cubic feet of lumber of various sorts, namely, of saw and building timber, 2,000,000 cubic feet; spruce for paper pulp, 850,000 cubic feet; telephone and telegraph poles, 125,000 cubic feet; firewood, 2,275,000 cubic feet; wood for charcoal, 6,600,000 cubic feet; miscellaneous, 150,000 cubic feet. Besides, there was each year brought to the works and consumed stub-wood to the amount of 1,500,000 cubic feet.

Certainly not more than 15, or at the highest 20, per cent of the cut-over area becomes restocked by natural seeding. The cuttings are not so large but what the by-standing trees can in an essential degree contribute to renewal, and, besides, very often 15 to 20 seed trees are left on each 1.22 acre tract. The difficulties which forest culture meets with in this locality are very stony land, spring and summer drought, spring frost, sometimes, as during the previous year, excessive rain, mossy or swampy land and land heavily pastured by cows and sheep. On the other hand, the forest area is not much troubled with heath, strong growth of grass, insects, etc. In regard to sowing, the twigs are burned immediately after the frost is out of the ground, and while the ground is damp. Generally the following year the cleared area is sown with pine and spruce seed. On pine land spruce seed is mixed to about 50 per cent. On land which is suitable

for both, 60 to 70 per cent of spruce seed is used. On pure spruce land 15 to 20 per cent of pine seed is mixed in. On cleared land, to prevent injury from drought, long, narrow seed strips—made by hatchets—are used about a yard apart, not large squares; but when heath or grass growth is to be feared then planting is to be preferred. For hacking of these seed strips are selected places which are suitable for the growth of the seeds and protection of the plants, such as the north side of shading objects,—for example, stumps, windfalls, fixed rocks, etc. The seed is laid on the south corner of the seed strip so that seed and plant will be better shaded. When sown on rocky land it has to be raked and covered by hand. On even ground the seed strips should be made in a direction from east to west, and the seeds not deep, harrowed down along the south border of the strips. On the other hand, on steep descents the seed strips should be laid horizontally, so that the seed, in case of heavy rain, shall not be washed down the hill. During the latest ten years there have been yearly about 2,400 acres sown with from 800 to 900 kilograms of conifer tree seed.

The planting of forest trees takes place on the company's land on a small scale and only where strong growth of grass hinders the growth of young forests. That is usual on good spruce land. There are planted four-year-old transplants from four to five feet apart, so that the number of plants on a tunnland (1.22 acres) varies between 2,250 and 3,500. The average number of trees standing on an acre at the time of cutting is very different, depending on previous cuttings. To more fully answer this question as to old forest on gravelly land which has not been subjected to other cuttings than the thinning of too crowded trees and cuttings of defective trees, the number of trees on two tracts, each of two and a half acres extent, have been counted with the following



result: First tract, average pine land, pure stand of pine; average age, 135 years; average height, 85 feet; diameter measured 5 feet from ground. There were found 8 trees with diameter of 5 inches, 13 of 6 inches, 20 of 7 inches, 27 of 8 inches, 34 of 9 inches, 42 of 10 inches, 44 of 11 inches, 44 of 12 inches, 53 of 13 inches, 40 of 14 inches, 30 of 15 inches, 16 of 16 inches, 11 of 17 inches, 3 of 18 inches, 2 of 19 inches; total, 385 trees, containing 9,178 cubic feet. Second tract, good pine land; young spruce successively grown up; pine of average age of 130 years and average height 85 feet; there were found 3 pines and 37 spruces 5 inches in diameter, 44 pines and 58 spruces 6 inches, 61 pines and 37 spruces 7 inches, 77 pines and 28 spruces 8 inches, 76 pines and 11 spruces 9 inches, 82 pines and 7 spruces 10 inches, 83 pines and 6 spruces 11 inches, 73 pines and 3 spruces 12 inches, 53 pines and 1 spruce 13 inches, 30 pines 14 inches, 14 pines 15 inches, 9 pines 16 inches, 5 pines 17 inches, 1 pine 19 inches, 2 pines 20 inches (in diameter); total, 613 pines and 188 spruces, in all 12,013 cubic feet.

Thus were found about 300 trees left per "tunnland" of about 5,300 cubic feet, which, according to an average age of 133 years, shows a yearly average growth of 40 cubic feet per "tunnland" (1.22 acres). If, on the other hand, timber cutting is done once or twice before the final cutting, as is usual, the number of trees at the last is much less. To prevent forest fires, during very dry weather, strict watch is kept by 30 forest guards and by extra ones, and in addition all of the company's dependents are obliged, when a forest fire breaks out, to send notice to the forest guard or forest manager and assist in extinguishing it. Generally the precautions are effective in preventing such fires. No forest fire worthy of mention has occurred in twenty years.

The company's land has been used for forest more than

100 years. It cannot be said what the net revenue is per acre, as the greater part of the product is used at the works in form of coal or fuel. The average yearly growth per "tunnland" ought to be 40 cubic feet, of which one fourth, or 10 cubic feet, should be saw timber of the net value of 1.50 kronor; 10 cubic feet of building timber, worth 1 kronor; 20 cubic feet of wood, worth 0.70 kronor, or, for the 40 cubic feet, 3.20 kronor (equal to \$0.85).

The income from game is not large. There are shot annually 12 elks, many hares and game birds.

SWITZERLAND.

The Swiss Confederation is composed of twenty-two cantons, which are separate and sovereign states; and while each canton has legislative authority over forests, the Confederation also exercises legislative authority over them in certain regards. Under article 24, of the Federal Constitution of May 29, 1894, the Confederation controls only the forests of the high regions, which are about 65 per cent of the total forest area of Switzerland. It is true that since the popular vote of July 11, 1897, which revises the said article 24, the Confederation has from now on the right of inspection of the forest police of the whole of Switzerland.

The federal law of March 24, 1876, which puts into execution the above-named article 24 of the constitution, was promulgated for the forests of the high regions. By the terms of that law the inspection by the Confederation extends over the entire territory of the cantons of Uri, Schwytz, Unterwald, Glaris, Appenzell, Grisons, Tessin and Valais and over the mountainous parts of the cantonal territories of Zurich, Berne, Luzerne, Zoug, Friburg, St. Gall, Jura and Vaud; but the law does not apply to the forests of the plains of the last mentioned





An ideal forest of Norway pine and thick undergrowth of white pine, from one to three feet high, on the island in Cass Lake. Photographed, September, 1900, for *the Annual Report of the Chief Fire Warden of Minnesota.*



states, nor to the forests of the cantons of Soleure, Bale, Schaffhouse, Argovia, Thurgovia, Neufchatel and Geneva.

The Confederation is not actually the owner of any forests, but a few of the separate states are owners. The forest domains are part of the national wealth, and comprise 91,587 acres. There are also in the cantons the forests of the municipalities and of the corporations, comprising 1,403,772 acres. Besides there are private forests, comprising 609,855 acres. The total area of forests is therefore 2,105,220 acres, or about 20 per cent of the total area of Switzerland.

Forests are found everywhere in Switzerland. The parts most heavily timbered are the mountain chains of Jura and of the cantons of Schaffhouse, Soleure, Argovie and Neufchatel. Forests are found starting at 200 meters above sea level (in the canton of Tessin) and reach as high as 2,100 meters in the high mountains. In Argovia they even reach 2,300 meters in altitude.

The more common varieties of trees are among the resinous kinds, the opicea, the fir, the larch, the Scotch and mountain pines, the Siberian pine; among the deciduous kinds, the birch and the chestnut tree; this last kind grows especially in the canton of Tessin.

The value of forest land varies greatly and depends on the location, the nature of the soil, thickness of the settlements, the increase of these settlements and on the trade in timber and other products of the forest. The value per hectare ($2\frac{1}{2}$ acres) may range accordingly from 300 francs to 6,000 francs.

In regard to expenses of administration, a distinction must be made between the expenses incurred by the Confederation and those incurred by the cantons. In 1897 the expenses incurred by the Confederation for forest administration amounted to \$56,000.

The following are the net receipts from forests in 1896 as to a few cantons :

Zurich, 180,900 francs, or 91.06 francs per hectare of forest.

Berne, 893,000 francs, or 71 francs per hectare of forest.

Soleure, 33,400 francs, or 44 francs per hectare of forest.

St. Gall, 71,000 francs, or 84.60 francs per hectare of forest.

Argovie, 241,000 francs, or 78.73 francs per hectare of forest.

Vaud, 236,000 francs, or 32 francs per hectare of forest.

The net receipts from town and municipal corporation forests in 1896 were :

Canton of Grisons, 1,200,000 francs, or 10.40 francs per hectare of forest.

Canton of Argovie, 2,378,000 francs, or 70.60 francs per hectare of forest.

On an average about 412 acres of forest have been created annually during the past twenty years, at the expense of the federal treasury.

In order to regenerate the forests, both planting and natural seeding are practiced, as may be most effective.

In the lowest countries, where clean cutting is practiced, planting is resorted to. Where real dangers exist from avalanches, land-sliding, etc., which do not permit complete denudation, and where gardening is required, natural modes of regeneration are generally used, and sowing is seldom done.

Reforestation by the Confederation in high mountain regions costs on an average 400 francs per hectare for 6,000 to 7,000 plants set in their places.

The federal and cantonal legislatures prescribe a sustained production for the forests of the state, of the towns and of the municipal corporations. If, through winds, snow-slidings or otherwise, too much timber has been destroyed, less cutting is done in the following years, in order that as rapidly as possible the forest may regain the number of trees fixed by the management. The forests are operated in various ways, according to localities and ac-



ording to the size of timber that is to be grown, viz., high forest, under-growth and coppice.

In accordance with the terms of the federal law, the forest area cannot be reduced. The cleared land must consequently be reforested except in cases where an equal area of land is covered into forest. Furthermore, the cantons as well as the Confederation have the right to compel the creation of protective forests wherever they are needed for public utility.

Forest fires seldom occur. Of those which do occur the principal causes are carelessness in lighting fires in the immediate vicinity of the forests, and lack of care in the woods. It is rare that a forest fire is occasioned by locomotives.

The administration charged to execute the federal forest law is the Federal Inspectorate of Forests, forming a part of the Swiss federal department of the interior. Nearly all the cantons have for their territories a forest administration. In the small states one single technical official is at the head of the service, but in the larger cantons the administration is under the direction of one or more chief forest inspectors or chiefs of the service and of several district foresters or forest inspectors. An inferior personnel instructed for the federal zone in courses lasting two months is attached to this technical personnel, and is organized to execute the work of forest economy.

A few cities or towns with extended and important forests have also a self forest administration, at the head of which is a person of technical forest training. Among them are Zurich, Berne, Lausanne, St. Gall, Winterthur, Friburg, Coire, Soleure, Schaffhouse.

The Chief Federal Inspector of Forests has an annual salary of 8,000 francs and fees of eight francs per day, and eight francs per night, when he has to be absent, for service; he gets his traveling expenses reimbursed,

his first assistant has a salary of 6,400 francs and is similarly indemnified for his inspection trips.

The three inspectors of the canton of Berne receive each 5,300 francs per annum. They receive extra pay, six francs per day and four francs per night, for all inspections made outside of their city, and their traveling expenses are reimbursed.

The high forester or chief inspector of the canton of St. Gall, who has a salary of 5,000 francs, receives ten francs per day and four francs per night, besides his traveling expenses, when out inspecting.

The Federal Inspectorate of Forests publishes every year a report on its management. The majority of the cantonal inspectors do likewise.

In the matter of taxes, the cantons are sovereign in their own limits. Taxation therefore differs according to the cantonal territory to which it applies. In all these states a tax on the forest is imposed, and in most states that tax is combined with the tax on income. But for one and the same forest only one of these two modes of taxation is generally applied. A few examples will show: In the canton of St. Gall the state has paid to the towns in which it has forests a tax of 1.20 francs per hectare. In Argovie the state pays to the towns where its forests are situated a tax of 2.40 to 3.20 francs per 1,000 francs of forest value. On the other hand, the towns only pay to the state a tax of 40 centimes per 1,000 francs of forest value. The private forest proprietor pays to the state 40 centimes and from 2.40 francs to 3.20 francs to the towns per 1,000 francs of forest value; and in addition thereto he is taxed on the income in the amount of one per cent of the average two per cent of gross declared value of the forest, but neither the state nor the towns pay a tax on the income of their forests.

WURTEMBERG.

Wurtemberg lies west of Bavaria, and is the third German state in point of area, its population being a little over 2,000,000. Its greatest length from north to south is 140 miles, and its greatest breadth is 100 miles. One-third of the Black Forest (so called from the dark foliage of its pines), and which forms a sort of a triangle, lies within Wurtemberg, two-thirds being in Baden. The Black Forest has a total length of 93 miles, and its breadth varies from 13 to 46 miles.

STATE FORESTS.

The aggregate extent of the state forests is 418,904 acres, and they extend over the entire kingdom. Fifty-nine per cent of the forests consists of pine, 20 per cent being pitch pine and 9 per cent white pine. The estimated value of the forest land varies from \$29 to \$58 per acre. The annual aggregate expense of administration of the forest amounts to \$1,183,574. Of this \$364,140 is paid to wood-cutters, \$147,560 is expended on roads, \$90,440 in forest culture, \$259,468 for pay of officials, \$148,468 for forest guards. The revenue was \$2,928,352, yielding a net revenue, after for 1895-1896 deducting all expenditures, of \$1,744,788, or \$3.63 per acre. The number of acres annually sown to forest is 296, and the number of acres planted to forest 6,177.

In regard to reforestation, when the natural seeding of the desired kind of wood occurs in proper time the same is used; otherwise planting or artificial growing takes place. Natural sowing is estimated at about 25 per cent; artificial renewing amounts to about 75 per cent. The latter is almost exclusively done by planting, whereas sowing in free woodland is very seldom applied. It is a principle to maintain (as far as the division of the age of the plantings

permit) an equal annual cutting. At present the cutting is fixed at 1.94 cubic meters per acre. The cutting is contracted for with laborers living in the neighborhood of the woods. By good management there are at a given plot generally trees of about the same age. If the natural seed falling is intended to be used, the larger trees, either single or in crops, are cut out in a direction against the prevailing winds; the remaining trees are thinned and gradually cut out as the growing young trees may demand. If the natural seed falling is not taken into consideration, the wood crop is cut clean in narrow strips, also in a direction against the prevailing winds, and the cutting of the second and following strips is postponed until the young plantings can dispense with the side protection of the old woods. It is a principle that replanting follows immediately after the cuttings. Moreover, the state buys every year about 400 acres of woodland to increase and round off the forests.

The amount of damage annually caused by forest fires is only \$642.60, and the principal cause of such fires is carelessness and negligence while smoking and lighting fires in or near the forests. In the last ten years, out of 120 forest fires only 8 were caused by sparks from locomotives, and of these only one caused considerable damage (about \$3,570).

In regard to the rank in the forest service, as compared with other branches of the public service, it may be said that the forest officials rank in general equally with those state officials who are graduates of the university. The Department of Forests is directed by one president, four technical and four administrative members and one commander of the forest guards. The salary of the president is \$1,844.50 per year; the salary of the members of the Board of Direction is from \$1,190 to \$1,618. A work entitled "The Forests of Wurtemberg," published by



Rueger, Stuttgart, 1880, gives a fair review of the situation of the forestry of the country. It may here be stated that in respect to net revenue Saxony and Wurtemberg stand at the head of forest administration and forest culture in general.

PRIVATE FORESTS.

The aggregate extent of private forests is 528,794 acres, of which 210,000 acres are administered by technical forest officials; the remainder is also administered in a proper manner. As the permission of the government is required for cutting and replanting of forest lands, and this permission is only given under the condition that an equal area to what has been cut shall be planted, the aggregate area of forest land remains the same throughout the whole country; but portions of it are gradually coming into the possession of the state government.

FREDERICK THE GREAT, THE FATHER OF GERMAN FORESTRY.

Frederick the Great promulgated laws in 1740 and 1754 for regulating the cutting of wood, which previously had been done as everyone pleased, without any regard to replanting. In place of such improvident practice he established rotations of 70 years; that is, he provided that forests should have 70 years in which to mature before being cut, also prescribed methods of thinning so that the young and healthy growth of oak and beech would be better protected. Later instructions were issued in 1764, 1770, 1780, 1783. In addition to this he instituted communal forests under the care of wardens, forbade private owners from every wasteful cutting and placed under the care of the state a portion of the forests in Silisia which previously

had belonged to private parties. Frederick the Great ordered the division of the national forests into compartments or blocks, each of which was to acquire the age of 70 years before being cut. But inasmuch as it was found that 70 years were not sufficient for the proper growth of the trees, each of these main compartments were subdivided into two compartments, so that a period of growth running 140 years was established.

There had been, in more ancient times, laws relating to forests for certain parts of Prussia, the first dating 1547. These related to the right of using the forest and necessity of replanting, more than to general systematic care. One can therefore properly claim that Frederick the Great is the father of the German forests, as it was he who created the existing forestry laws and made them apply to private as well as to state forests.

THE WORKING PLAN.

The "Manual of Forestry" in five volumes, by Dr. William Schlich, principal professor of forestry at the Royal Indian Engineering College, Cooper's Hill, England, and formerly Inspector General of Forests to the Government of India, is the best work on the subject in the English language. Dr. Schlich has kindly given me permission to copy from his third volume an account of the "working plan" as used in forestry, and what follows on that subject is taken from that volume.

Forest working plans regulate, according to time and locality, the management of forests in such a manner that the objects of the industry are as fully as possible realized. The working plan for a protection forest, or a park-like forest, is altogether different from that of a forest which





is managed on economic principles. The latter is the kind with which we have here to do.

The working plan report is a document which gives necessary information and which describes the system of management in such detail as may be required in each case. For forests which are of great value, and which yield high returns, very detailed plans should be drawn up; for forests which give as yet only small returns, simple plans would be indicated.

WORKING PLAN REPORT.

INTRODUCTION.

I.—GENERAL DESCRIPTION.

1. Name and situation of forest; name of proprietor.
2. Boundaries.
3. Area.
4. Configuration of the ground.
5. Rock and general character of the soil.
6. Climate.
7. Legal position of forest, rights and privileges.
8. Surrounding population and its requirements.
9. Markets, lines of export.
10. Prices of the several classes of produce.
11. Cost of extraction and of transport to markets; supply of labor.
12. General description of forest growth.
13. Injuries to which the crop is exposed.
14. Rate of growth.
15. Yield tables, volume tables. form factors, reducing co-efficients, etc., used in the calculation of the volume and increment of the woods.
16. Organization and strength of the forest staff.

II.—DETAILED DESCRIPTION OF COMPARTMENTS.

III.—DIVISION AND ALLOTMENT OF AREAS.

IV.—DESCRIPTION OF THE METHOD OF TREATMENT.

1. The objects of management.
2. Choice of species.
3. Choice of silvicultural system.
4. Determination of the rotation.
5. General lines of treatment.
6. General lines of yield.

V.—SPECIAL WORKING PLANS.

1. Plans of utilization.
 - a. Final cuttings.
 - b. Intermediate cuttings.
 - c. Minor produce.
2. Plan of formation.
3. Plan of other works.
4. Maps illustrating the condition of the forest and the proposed treatment.

VI.—MISCELLANEOUS.

1. Reorganization of the forest staff.
2. Financial forecast.
3. Proposals for the control of the execution of the working plan.
4. Miscellaneous observations.

WORKING PLAN FOR A PORTION OF THE STATE FORESTS OF
THE HERRENWIES RANGE IN THE BLACK FOREST,
GRAND DUCHY OF BADEN.

PERIOD 1884—1893.

WITH THE RESULTS OF THE ACTUAL WORKING.

GENERAL DESCRIPTION.

1. *Area and Boundaries.*

The areas are recorded as follows:

(a) Productive area		1,747 acres
(b) Unproductive area		nil. "
(c) Other areas, including fields, meadows, etc.		2 "
Total area		= 1,749 acres

Alterations in the above figures will probably become necessary when a fresh survey is made.

The outer boundaries are in order, but the internal boundaries require rectification.

2. *Locality.*

The forest here in question occupies on the whole the slopes lying between a hill range on the south and the river Schwarzenbach on the north. The highest point of the hill range, the Hoher Ochsenkopf, has an elevation of 3,465 feet above the sea, while the lowest part, near the Schwarzenbach, is only 2,000 feet above the sea, the mean elevation being placed at 2,600 feet.

The slopes, on which the forest is found, are mostly steep, level spots being only found on the summits of the hills, and toward the lower end, where granite and Bunter Sandstein meet.

The area is drained by the Schwarzenbach (a feeder of the Raumtinzach) with its two feeders, the Gartenbach and Dobelbach. The first mentioned runs from west to east, and the two latter, more or less, from south-west toward north-east. It follows that the forest in the valley of the Schwarzenbach has generally a north aspect, and in the valleys of the Gartenbach and Dobelbach a northwest aspect on one side, and a southeast aspect on the other side of the streams. All the forest areas (except those situated at the highest elevations and which are of no importance) are protected by intervening ranges against the prevailing winds.

Up to a mean elevation of 2,500 feet, granite is the principal rock, which is sometimes (though rarely) pierced by porphyry. Above the afore-mentioned elevation the granite underlies upper Bunter Sandstein (Vogesen Sandstein), and the latter accordingly prevails in the larger part of the forest area.

The granite is generally rich in orthoclase and oligoclase, and therefore decomposes readily, and furnishes mostly a deep soil rich in mineral elements. The decomposition is facilitated, and the quality of the soil improved, by the remarkably numerous springs which appear between the granite and the Bunter Sandstein. Hard slow decomposing quartzite is of rare occurrence.

The Bunter Sandstein is characterized by rapidly and greatly changing mineral composition, consisting sometimes of readily decomposing rock yielding a deep clay soil, in other cases of hard quartz-gravel, frequently found on the surface in the numerous bolder-drifts. The Bunter Sandstein has numerous rents and fissures in all directions, so that it is rapidly drained, and the disintegration and decomposition are only rarely assisted by springs, which at the best are scanty and intermittent. It follows that the Bunter Sandstein soils, even when formed by the easily decomposed and minerally rich clay sandstone, never equal the best quality of the granite soil; moreover, they change frequently and very suddenly, and without any visible cause, into almost unproductive areas.

On the flat hill tops, layers of fine white sand (produced by the disintegration of the gravelly sandstone) frequently produces an impermeable stratum, preventing the water from percolating, thus causing bogs (or "Grinde") which often extend over considerable areas and are almost unproductive.

The quality of the soil, therefore, ranges between good and unproductive, in the following proportion:

Good and fairly good to medium	= 78 per cent.
Medium to indifferent	= 12 "
Indifferent to unproductive	= 10 "

The climate is rough, and is characterized by long winters with an abundant snowfall, and by rapid changes of temperature; at the same time it is throughout favorable for forest vegetation, especially for conifers.

3. *Species.*

The details will be found in the description of compartments. Generally speaking, the spruce and silver fir are the prevailing trees, the former being more abundant in the middle and upper parts, the latter at the lower elevations. The beech is associated with them locally and in varying proportions. Scotch pine is found in the granite region chiefly upon dry, steep, rocky slopes with a southerly aspect, and in the sandstone region, especially on dry ridges and the top of the mountains, as well as here and there in other localities. The three conifers attain a maximum height of 140 feet, with regular shaped and little tapering stems. Toward the upper limit of the area the height growth diminishes rapidly, dwindling down to 20 or even 15 feet on the high plateaux. Here the mountain pine and the birch are also found. Reproduction is generally good, except at the higher elevations. A marked difference is found between northern and southern slopes, the growth and reproduction being far more vigorous on the former than on the latter.

The silver fir is much exposed to cancer. Windfalls and snow breakage are fairly moderate, while the damage from insect attacks is very small. During the years 1874-83, the following proportion existed between the different classes of fellings:

Cuttings caused by insect attacks	=	1	per cent of total fellings.
" " snow breaks	=	12	" " "
" " windfalls	=	16	" " "
Cancer and other diseases and injury	=	19	" " "
Other cuttings	=	52	" " "
Total	=	100	" " "

4. *Method of Treatment and Rotation.*

The situation and the species necessitate the area being treated under the high forest system. The quality gradations, as indicated under 2, are so conspicuous locally that it is possible (as well as desirable in order to secure a proper idea of the condition of the forest), to group the growing stock according to its characteristics as produced by the quality of the locality, and according to the method of treatment thereby indicated. The actual basis of this grouping is the yield, and based upon it, the net income or financial result of the management. In this sense the forest may be divided into the following three groups:

a. Areas Subjected to an Intensive Management.—To this group belong all areas which, in virtue of their quality (as indicated mainly by the height growth of the trees on fully stocked areas) are capable of producing large timber; areas on which carefully conducted regeneration fellings will produce natural regeneration within a reasonable period of time, and where the cost of any artificial assistance in regeneration is commensurate with the anticipated returns. As lowest limit of this group a normal increment of 43 cubic feet per year and acre, calculated for a rotation of 120 years, has been fixed. The area thus included in the group amounts to 78 per cent of the whole. It is with this area, and the growing stock standing on it, that the management must more especially reckon, and from which the

largest possible sustained yield must be secured. With a suitable composition of the growing stock and a careful application of silvicultural principles, that object may be obtained under an average rotation of 120 years.

As regards the silvicultural treatment, and especially the regeneration of the woods, two different classes of forest or growing stock (corresponding with two qualities of locality) stand out prominently.

First: Forest of spruce with a strong admixture of silver fir (the latter occasionally predominating) more or less frequently interspersed with beech and more rarely with Scotch pine.

Secondly: Forest in which spruce predominates with a slight admixture of silver fir and here and there of Scotch pine, but devoid of beech.

The first class of forest occurs in the granite area and on those parts of the Bunter Sandstein (clay sandstone), which have deep, easily decomposed soils fit to be classed as good. The characteristic features of this class of forest are the occurrence of beech and deep soils, rarely covered with boulders or debris, lying mostly at the lower elevations; natural regeneration can here be successfully effected in a comparatively short period of time.

The second class of forest occupies the stony slopes of the Bunter Sandstein area, and in exceptional cases the quartzite parts of the granite area. Here the soil is generally covered with loose boulders and rock debris of varying size. These areas are nearly all found at the middle to upper elevations. The conditions described demand the maintenance of an uninterrupted canopy up to the age of maturity, and a careful execution of the regeneration cuttings spread over a prolonged period of time, or else weeds will spring up, which make regeneration very difficult, and at any rate expensive.

On the whole, however, careful management is sure to be successful in securing natural regeneration in all the areas pertaining to this group; for this purpose, as well as for the production of valuable timber, a rotation of 120 years on an average is considered of sufficient length. The length of the regeneration period differs considerably in the different parts, varying on the whole from 30 to 50 years.

b. The second group consists of woods growing on soils, which, even under the most careful management, cannot be expected to produce trees of first or even second quality. The trees here produced are of such limited height growth, that the production of valuable timber is out of the question. The woods are found in the upper, and here and there in the lower part of the Bunter Sandstein area, where the soil is covered with large masses of the debris of gravelly sandstone, which is not easily decomposed, and where the slightest interruption of the canopy overhead is followed by the appearance of a dense growth of bilberry and heather.

Nevertheless, these areas are capable of yielding timber of the inferior classes, as well as firewood, and the returns which may reasonably be expected from them, justify the application of a method of treatment which, while avoiding any interruption in the canopy and all expensive cultural operations, facilitates natural regeneration; in other words the treatment under the selection system by removing all trees which are deteriorating or incapable of increasing in value. It is difficult to fix any definite rotation, but it is estimated that the trees will take about 150 years to reach maturity.

The lowest quality limit for this group has been fixed at 7 cubic feet increment per acre and year, while the upper limit is, as already indicated, 43 cubic feet. The area comprised in this group amounts to 12 per cent of the total area.

c. The third group comprises the so-called "Grinden," that is to say the highest parts of the ridges, which are mostly level and have a tendency to boggi-ness. They are covered by a dense growth of bilberry and heather, and are incapable of producing more than a stunted tree growth, which yields only a scanty quantity of firewood, frequently not covering the price of preparing it; hence financial considerations are entirely out of the question, the areas being protected merely for the sake of preserving some cover on the hill tops. The group comprises all parts which produce an annual increment per acre of 7 cubic feet and under; they amount to 10 per cent of the total area.

In so far as the management aims at the production of valuable material, and at favorable financial results as regards outlay for artificial regeneration (where natural regeneration has failed), for improvement, tending, etc., only the areas in the first group can be considered. But in the treatment of those forests which pertain to the principal mountain region of the Black Forest, representing a certain drainage area, the task of forestry goes beyond mere financial considerations. It has in fact been recognized that it is necessary to keep areas of this class well wooded for the sake of a proper husbanding of the water supply in the streams. Accepting this further task, the forest administration has endeavored, during the last 50 years, to afforest the poorly stocked and frequently entirely bare areas at the higher elevations of the Bunter Sandstein region. In so far as the cultural operations were confined to the boulder drifts of the Bunter Sandstein, they were moderately successful, but the cultural attempts made in the "Grinden" prior to 1870 turned out failures. Since 1873 the cultural operations in the Grinden present a more hopeful aspect, owing to the experience gained by former failures, and it seems desirable to continue them in the future.

The working plan deals in detail only with the forest area subjected to intensive management, but the group worked under the selection system has also been adequately noticed in the general provisions.

The working plan lays special stress upon the execution of improvement fellings, more particularly the removal of cancerous silver firs. For this purpose the ordinary thinnings are utilized; but over and above these, cancerous trees must also be removed from the old woods, where otherwise no further thinnings would be required. In regeneration fellings the trees to fall first under the axe must be those attacked by cancer. Even then not nearly all cancerous trees can be removed during the next ten years. This fact teaches the management that in future a sharp attack must be made on all cancerous trees at the time of the first and second thinnings, even if a temporary interruption of the canopy should thereby be caused. On the rich deep soils of the granite area, which are almost exclusively concerned in these remarks, even an interruption of the canopy extending over a somewhat lengthy period would not be a misfortune, and preferable to the maintenance of a full canopy consisting to a considerable extent of cancerous trees. The existence of enormous quantities of such trees on the granite area was one of the reasons which led to the yield being fixed at its present rate.

5. *Utilization.*

a. Yield of Major Produce.—The actual yield during the last 40 years has been as follows:

Compartment.	YIELD, IN SOLID CUBIC FEET.					
	1844-53.	1854-63.	1864-73.	1874-83.	Total.	Area in Acres.
1. Schwarzenbronn....	218,896	122,909	149,848	79,141	569,189	65
2. Schwarzenberg.....	811,518	158,778	200,738	158,965	829,964	211
3. Riesenkopf.....	12,502	47,288	206,242	65,617	331,649	76
4. Mehlskopf.....						84
5. Grünwinkel.....	19,742	124,629	57,423	202,252	404,046	202
6. Dobelbach.....	26,875	42,697	30,195	69,952	169,692	178
7. Hoher Ochsenkopf..						101
8. Kleingartenkopf....	84,256	2,381	1,448	1,024	89,069	76
9. Kleingarten.....	375,687	188,825	256,603	196,578	966,693	862
10. Grossgarten.....	62,544	46,688	26,417	59,118	194,767	175
11. Sachsenbronn.....	84,927	47,783	111,851	106,194	350,255	95
12. Gartenbach.....	86,811	88,845	494,665	156,412	826,733	172
	1,178,198	814,783	1,584,920	1,094,216	4,622,067	1,747
Average per year.....	117,820	81,473	153,492	109,422	115,552	.....
Average per year and acre.....	67.44	46.64	87.86	62.68	66.14	.....

From the appended statistical table it will be seen that the estimated increment of the next ten years amounts to 1,086,130 cubic feet.

The actual growing stock amounts to 9,488,731 cubic feet

The normal " " 7,892,160 "

The surplus of " " 1,596,571 "

The surplus of growing stock is due to a surplus of woods over 100 years old. With favorable prices for timber, the removal of this surplus in the shortest possible time would be advisable, so as to prevent loss of increment, and take unnecessary capital out of the forest, but as prices run low at present, it appears judicious to keep the greater part of it over for a while.

A consideration of the several compartments showed that the removal of the following material during the next ten years is advisable on sylvicultural grounds:

Final cuttings 1,146,000 cubic feet

Intermediate cuttings 154,000 "

Total 1,300,000 "

As this amount exceeds the expected increment by 213,870 cubic feet, equal to about one-seventh of the surplus of growing stocks, the yield has been fixed at 1,300,000 cubic feet, or annually:—

Final cuttings 114,600 cubic feet

Intermediate cuttings 15,400 "

Total 130,000 "

If in the course of the 10 years prices should rise, there would be no objection to reduce the surplus of growing stock further by additional cuttings.

The disposal of the yield is effected as follows:

- | | |
|--|-------------------|
| 1) Free grant to the Roman Catholic Priest at Herrenwies, = | 1,500 cubic feet. |
| " " " School " = | 1,000 " |
| (2) Sale by public auction and occasionally by private sale, = | 127,500 " |
| <hr/> | |
| Total annual disposals | 130,000 " |

b. Minor Produce.—The principal items are forest pasture and the removal of litter, the utilization of which is permitted to the Herrenwies settlers, as a privilege.

According to government orders the privilege of forest pasture may be exercised only to such extent as the condition of the forest and the requirements of regeneration may permit. The district forest officer indicates from time to time the localities in which the privilege may be exercised. The privilege of removing litter free of charge is exercised under the same conditions. The exercise of these privileges is nowhere injurious, and may be continued during the next ten years.

The grass growing in blanks, on roads and in plantations has hitherto been sold for the benefit of the State, and, under suitable supervision, the practice may be continued.

The removal of building stones, the sale of plants, etc., is insignificant.

6. Division into Compartments.

The contemplated new division into compartments must be postponed until the projected road system has been completed.

DESCRIPTION OF COMPARTMENTS.

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
<i>I. Ochsenköpfe.</i>			
Schwarzenbronn	1	65	Spruce with silver fir, some beech, Scotch pine, larch. About .6 of area 30—50 years old, some trees older. About .4 of area 10—30 years old. Above the road fairly complete stocking; in youngest parts still suffering from frost; below road still some blanks caused by late cutting out of old trees; in the latter part still 120—150 years old spruce and silver fir in the final stage; these show a decreasing increment. Growth on the whole fairly good.
Schwarzenberg	2	211	<i>a</i> — 180 acres; 15—40 years old spruce and silver fir with some Scotch pine and beech; some lately planted, younger, a few up to 60 years old. About 25 acres planted. Where the shelter wood has been removed, stocking generally complete, in the rest still patchy with patches of bilberry intervening. Growth generally between good and fairly good; along Herrenwies meadows partly only fair, the spruce still suffering from frost. In the north-western part, below the road, on the Riesenkopf road, and in the south-east along Dobelbach, on about 37 acres 110—140 years old spruce and silver firs of decreasing increment are standing in the final stage.



or Cut over, non-agricultural area, 1950

DESCRIPTION OF COMPARTMENTS—*Continued.*

Block and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
Riesenkopf.....	8	76	<i>b</i> — 81 acres (in three parts), spruce and silver fir with a few beech and Scotch pine, generally 50—75 years old, but some small groups only 80—90 years old; generally well stocked, here and there somewhat thin and patchy. Growth between good and fairly good. On 8 acres on the Dobelbach, 80—90 years old spruce, cover complete and growth good. <i>a</i> — 47 acres; 100—180 years old spruce and silver fir, some older; on the whole cover fairly complete; toward compartment Schwarzenberg somewhat thin, but on about 10 acres with a fair young crop of silver fir and spruce up to 15 years old. Growth fairly good, on the higher part inferior. About 5 acres along the road is a windfall area, now stocked with some silver fir and spruce growth. <i>b</i> — 24 acres; 9—20 years old spruce (a few older), with some Scotch pine and larch, mostly well stocked, showing good to fairly good growth. <i>c</i> — 5 acres; Grinde, in upper part heather covered, with 100 and more years old short and stunted Scotch pine, some spruce and mountain pine. On the whole poorly stocked. Part underplanted with 20—40 years old spruce, which show very poor growth.
Mehlskopf.....	4	84	50—90 years old (and more), mountain pine with some spruce, Scotch pine, birch and mountain ash; toward compartments 8 and 5 cover fairly complete, in the southern and south-western parts interrupted by larger and smaller areas of heather. Growth inferior.
Grünwinkel.....	5	202	<i>a</i> — 186 acres; 110—150 years old, some older, spruce and silver fir, some beech with a few Scotch pine. In irregular final and seeding stage, in the southern part cover still fairly complete in strips. On .4 of the area stocked with up to 80 years old silver fir and spruce and a few beech. Growth of old trees still fairly good; on some stony ridges (about 7 acres) middling and inferior; young growth mostly only middling. <i>b</i> — 16 acres on the highest part in the south and west, Grinde; heather-ground with 100 and more years old crippled Scotch pine, spruce, some mountain pine and birch; in some parts up to 60 years old advance growth thinly stocked. Here and there traces of plantings, 24 years old spruce.
Dobelbach.....	6	178	<i>a</i> — 133 acres; 100—180 years old, some up to 200 years, spruce and silver fir, some Scotch pine; on the whole cover fairly complete; only in the western third along Grünwinkel through windfalls and dry wood cuttings somewhat thin and patchy; in the thin parts as yet little, up to 15 years old, advance growth in single trees. Growth good to fairly good. (<i>Ilex</i> found). <i>b</i> — 27 acres (consisting of the upper south-eastern portion and a ridge running from it in a north-western direction to the centre of the compartment), 100—180 years old (some older), short-stemmed spruce with some Scotch pine and silver fir forming a thin, often very thin, wood; in parts younger up to 60 years old spruce, or an incomplete miserable under-

ANNUAL REPORT OF

DESCRIPTION OF COMPARTMENTS—*Continued.*

and Compartment.		Area in Acres.	Description of Wood.
Name.	No.		
			growth of 25 years old spruce and Scotch (experimental planting). Growth middling inferior.
			<i>c</i> = 18 acres (uppermost part on the s Grinde; heather land with 100 years and old crippled Scotch pine, some spruce, thinly stocked; here and there remnants years old planted spruce and Scotch pine.
Hoher Ochsen.....	7	101	70 and up to over 100 years old Scotch and mountain pine with spruce, some 1 sometimes forming a very thin wood of s trees, sometimes in smaller or larger gr everywhere intersected by heather places blanks. Growth inferior, even crippled.
Kleingartenkopf.....	8	76	100—120 years old, in some parts you some over 300 years old, spruce with S pine, few silver fir, some mountain pine the western third and on the eastern still fairly well stocked, some groups even stocked; otherwise the wood is very thin open. Growth middling to inferior; here there an incomplete miserable undergrowth 80—50 and more years old spruce and S pine (planted).
Kleingarten.....	9	302	<i>a</i> = 161 acres; spruce and silver fir, beech. Mostly 50—80 years old, in strips single trees up to 100 years old, others 80—50 years old. In the eastern part about 50 acres 80—100 years old. Everywhere spruce and silver fir standards up to 150; old, mostly showing good growth. A' throughout rather thinly stocked, here there patchy, in consequence of late findings and removal of cancerous silver Growth mostly good, only toward the so higher part decreasing. <i>b</i> = 122 acres (in 3 places); spruce and fir with some beech, $\frac{15-40}{\text{average} = 80}$ years some groups up to 50 years; most stocked. 120—150 years old (some older) pruned spruce and silver firs in the f are standing almost everywhere above younger growth. The st Dobelbach is finally cleared. Growth of the old trees fairly good. <i>c</i> = 79 acres (upper part toward 120—300 years old pruned Scotch spruce, few silver fir and birch, thin often open; on the whole poorly with 20—50 years old spruce (mostly a few silver fir; the latter in some with up to 100 years old spruce, a selection forest. Soil much heather. Growth middling to fairly good. On 6 acres near compartment the main path, 100 and more years with a few Scotch pine and a thin canopy and show middling
Grossgarten.....	10	175	<i>a</i> = 108 acres; spruce and years old, some up to 150, a few Scotch pine. Partly full greater part somewhat thin. very thin; and here spruce advance growth up to 50 years and groups. Growth good

DESCRIPTION OF COMPARTMENTS—*Continued.*

Compartment.	Area in Acres.		Description of Wood.
	No.		
Sachsenbrunn.....	11	85 (and 2 acres other areas.)	the upper parts with stones (Halde), partly middling only. <i>b</i> = 37 acres. (Ridge through middle of compartment and strip on south, southwest, and northwest.) 90–110, some up to 200 years old, spruce and Scotch pine, some silver fir, in the uppermost part some mountain pine in a thin, patchy, and often very thin wood; most of inferior growth; here and there traces of 30–40 years old spruce plantings. <i>c</i> = 30 acres (adjoining compartment Kleingarten). A wood resembling a selection forest, of spruce and silver fir with beech, the trees 30–60 years old prevailing; little quite young. The 100–120 years old and older trees appear single and in groups. Growth good; above the cattle track inferior. 100–120 years old (some up to 200 years), spruce and silver fir, also some beech, namely: On 42 acres, final stage, partly pruned, throughout with $\frac{10-30}{20}$ years old (in the western part up to 40 years old), silver fir and spruce young growth; about 25 acres in the position of the seeding stage brought about by windfalls and dry wood cuttings; on 5 acres 80–100 years old, generally complete cover; in the thinner stocked parts is found up to 15 years old silver fir and spruce young growth; on 12 acres (southeastern corner, near compartment Gartenbach) generally canopy complete, here and there with a little advance growth. On 10 acres (in the west), 70–90 years old, some older spruce with silver fir, fairly complete canopy. On 7 acres (western point), 12–40 years old (in groups and single up to 60 years old), mostly irregular young growth of spruce with some silver fir, forming a fairly complete stocking. Growth of old trees good to fairly good, in the pruned portions partly less good; growth of young wood fairly good.
Gartenbach	12	172	110–140 years old spruce, silver fir, some older, some Scotch pine, the latter prevailing in places in the upper part, few beech; in the northern two-thirds in the final stage, partly in seeding stage. In these two-thirds about 85 acres are stocked with young growth of spruce and silver fir pretty completely, in the eastern part very fully; in the southern third still fairly complete cover, but on the western slope, already somewhat thin, as yet little young growth. Growth in northern two-thirds good, in the southern third good to fairly good; in the upper part, in the southeast, only middling. In the middle of the compartment are 3 windfalls and 1 beetle clearing, together 13 acres; of these, 7 acres fairly well stocked with up to 25 years old spruce and silver fir.



OF THE HERRENWIES RANGE.

CLASSES.						Volume per acre, cubic feet.	INCREMENT.			
81—100.		Over 100 years.		Total.			Annual, per acre.		Total in 10 years.	
Cubic ft.	Acres	Cubic ft.	Acres	Cubic ft.	Acres		Normal	Real.	Normal.	Real.
43 cubic feet per Acre Annually.										
		84,250	4	152,910	65	2,352	85	70	55,250	45,500
15,892	2	118,692	12	697,130	211	3,304	85	75	179,350	158,250
		381,408	37	400,480	71	5,641	70	61	49,700	43,310
		1,606,861	148	1,628,050	186	8,753	85	71	158,100	132,000
		1,522,104	133	1,522,104	133	11,444	100	71	133,000	94,430
353,156	49	540,329	43	1,628,050	233	5,753	100	73	288,000	220,740
494,418	49	305,870	49	958,406	138	6,945	85	85	117,300	117,300
42,379	5	459,103	54	565,403	95	5,952	100	71	95,000	67,450
		1,373,758	124	1,387,178	172	8,065	100	86	172,000	147,920
905,845	105	6,402,345	584	8,939,771	1,354	6,603	.....	76	.....	1,026,960
				7,456,200	.....	5,507	92	.....	1,242,700	.....
				1,483,571	.....	1,066	.....	16	.....	5,740
7 to 43 cubic feet per Acre Annually.										
		38,850	27	40,620	27	1,504	30	21	8,100	5,670
		203,413	51	214,013	76	2,816	14	14	10,640	10,640
		108,419	54	119,337	79	1,511	43	29	33,970	22,910
		79,460	37	79,460	37	2,148	21	21	7,770	7,770
		430,147	169	453,460	219	2,071	.....	21	.....	46,990
				362,880	.....	1,657	28	.....	60,480	.....
				90,580	.....	414	.....	7	.....	13,490
cubic feet and under per Acre Annually.										
		4,500	5	4,500	5	900	7	7	850	350
				18,900	34	556	7	7	2,380	2,380
		11,300	16	11,300	16	706	7	7	1,120	1,120
		7,400	18	7,400	18	411	7	7	1,260	1,260
		53,400	101	53,400	101	529	7	7	7,070	7,070
		76,000	140	95,500	174	549	.....	7	.....	12,180
				73,080	.....	420	7	.....	12,180	.....
				22,420	.....	129	.....	.....	.....	.....
Three Working Sections.										
				9,488,731	.....	.....	.....	.....	1,086,180	.....
				7,892,160	.....	.....	.....	.....	1,315,360	.....
				1,596,571	.....	.....	.....	.....	.....	229,230

SPECIAL WORKING PLAN.

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final. Cubic feet.	Inter-mediate Cubic feet.			
1. Schwarzenbrunn...	Final cutting in regenerated part.....	34,000				
	Filling up blanks with spruce.....			8		
	Thinning and cutting of cancerous silver firs....		10,000			
	Total.....	34,000	10,000	8		
2. Schwarzenberg....	a Thinning of shelter-wood and partial final cutting.....	35,000				
	Filling up blanks with spruce and Scotch pine.			10		
	a and b Thinning and removal of cancerous trees.....		53,000			
	Total.....	35,000	53,000	10		
3. Riesenkopf.....	a Seeding cutting, and partly final cutting....	53,000				
	b and c Rest.					
	Total.....	53,000				
4. Mehliskopf.....	Rest.					
5. Grünwinkel.....	a Thinning of shelter-wood, seeding cutting in the fully stocked parts by the removal of cancerous and large trees.....	318,000				
	b Rest					
	Total.....	318,000				
6. Döbelbach.....	a Thinning and removal of cancerous trees.....	19,000	19,000			
	b and c Rest.					
	Construction of an export road to meet the main road.....					
	Total.....	19,000	19,000			
7. Hoher Ochsenkopf	Rest.					
8. Kleingartenkopf...	Rest.					

SPECIAL WORKING PLAN—*Continued.*

COMPARTMENTS.	DESCRIPTION OF CUTTINGS, CULTIVATION, ETC.	CUTTINGS.		Cultivation. Acres.	Draining Ditches, Feet.	Road Construction, Feet.
		Final. Cubic feet.	Intermediate Cubic feet.			
9. Kleingarten.....	<i>a</i> Cutting of all old standards and cancerous trees.....	45,000	.....	.....	.....	.....
	Thinning.....	.....	3,000	.....	.....	.....
	<i>b</i> Thinning of shelterwood and partially final cutting.....	198,000	.....	.....	.....	.....
	Filling up blanks with spruce.....	.....	.....	12	.....	.....
	<i>c</i> Cutting out of old defective trees where young growth exists... Construction of an export road to meet the main road.....	14,000	.....	.....	.....	9,500
	Total.....	257,000	3,000	12	.....	9,500
10. Grossgarten	<i>a</i> Thinning and removal of cancerous trees.....	47,000	47,000	.....	.....	.....
	<i>b</i> Rest.....	.....	.....	.....	.....	.....
	<i>c</i> Removal of standards and cancerous trees....	25,000	.....	.....	.....	.....
	Thinning.....	.....	15,000	.....	.....	.....
	Construction of an export road.....	.....	.....	.....	.....	5,000
	Total.....	72,000	62,000	.....	.....	5,000
11. Sachsenbronn....	In the regeneration area: thinning of shelterwood and partially final clearing; in the rest seeding cutting.....	163,000	.....	.....	.....	.....
	Filling up blanks with spruce.....	.....	.....	3	.....	.....
	Construction of an export road.....	.....	.....	.....	.....	3,500
	Total.....	163,000	.....	3	.....	3,500
12. Gartenbach.....	Continuation of regeneration cuttings and removal of cancerous trees.....	195,000	.....	.....	.....	.....
	Thinning in fully stocked parts.....	.....	7,000	.....	.....	.....
	Filling up blanks with spruce and Scotch pine.....	.....	.....	8	.....	.....
	Construction of an export road.....	.....	.....	.....	.....	3,000
	Total.....	195,000	7,000	8	.....	3,000

SUMMARY OF THE PROVISIONS OF THE

COMPARTMENT.	PROVISIONS OF WORKING PLAN.					
	Cuttings.			Cultiva- tion. Acres.	Drain- ing. Feet.	Road Con- struction.
	Final. Cubic Feet.	Inter- mediate. Cubic Feet.	Total Cubic Feet.			
1. Schwarzenbronn.....	84,000	10,000	44,000	8	.....	.....
2. Schwarzenberg.....	85,000	58,000	88,000	10	.....	.....
3. Riesenkopf.....	58,000	.....	58,000	.....	.....	.....
4. Mehlskopf.....	.....	.....	.....	.....	.....	.....
5. Grünwinkel.....	818,000	.....	818,000	.....	.....	.....
6. Dobelbach.....	19,000	19,000	88,000	.....	.....	4,900
7. Hoher Ochsenkopf...	.....	.....	.....	.....	.....	.....
8. Kleingartenkopf.....	.....	.....	.....	.....	.....	.....
9. Kleingarten.....	257,000	8,000	260,000	12	.....	9,500
10. Grossgarten.....	72,000	62,000	134,000	.....	.....	5,000
11. Sachsenbronn.....	168,000	.....	168,000	8	.....	3,500
12. Gartenbach.....	195,000	7,000	202,000	8	.....	3,000
Total.....	1,146,000	154,000	1,800,000	86	.....	25,900

NOTE.—The excess was due to heavy windfalls; it will not derange future

WORKING PLAN AND OF THE EXECUTION.

RESULTS OF ACTUAL WORK DONE.						COMPARISON OF PROPOSED AND EXECUTED CUTTINGS.		Remarks.
Cuttings.			Culti- vation. Acres.	Drain- ing. Feet.	Road Con- struction. Feet.	Cut too much. Cubic Feet.	Cut too little. Cubic Feet.	
Final. Cubic Feet.	Inter- mediate. Cubic Feet.	Total. Cubic Feet.						
38,084	12,549	45,583	4.4	.....	.....	1,588	.....	Excess due to windfalls and snow-break.
54,517	75,000	129,517	5.0	.....	.....	41,517	.....	
132,900	.....	132,900	1	.....	.....	79,900	.....	Excess due to windfalls and snow-break.
177,169	.....	177,169	1	.....	.....	.....	140,821	Held back, on account of ex- tra fellings in other compsta.
86,606	68,901	154,907	.....	.....	5,008	116,907	.....	Excess due to windfalls.
842,444	21,635	864,079	8.4	.....	9,679	104,079	.....	Excess: wind- falls and con- struction of road.
95,852	.....	95,852	.....	.....	5,299	.....	88,144	Thinning held over.
111,049	.....	111,049	9	.....	8,691	.....	51,951	Held back on account of ex- cess in other compartments
197,680	.....	197,680	.....	.....	2,958	.....	4,840	
1,231,231	177,485	1,408,716	18.9	.....	26,625	108,716	.....	

arrangements, as there is yet a considerable excess of growing stock in the forest.

SAMPLE PAGE OF THE DETAILED CONTROL BOOK.

1. *Schwarzenbronn.*

Year.	Description of Cuttings, Cultivation, etc.	CUTTING.		Cultivation. Acres.	Draining Ditches. Feet.	Road Construction. Feet.
		Final Cubic feet.	Inter- mediate Cubic feet.			
<i>Provision of Working Plan.</i>						
	Final cutting in regenerated part..	34,000				
	Filling up blanks with spruce			3		
	Thinning and cutting of cancerous silver firs.....		10,000			
	Total.....	34,000	10,000	3		
<i>Execution.</i>						
1884	Final cutting.....	14,297				
1884	Dry and windfall wood.....	813				
1885	Windfalls	665				
1886	Final cutting, thinning.....	6,166	832			
1886	Windfalls	547				
1887	Windfalls	1,363				
1888	Final cutting, thinning.....	7,759	11,717			
1888	Planting.....			1.7		
1888	Windfalls	82				
1889	Dry wood, windfalls	649				
1889	Planting.....			2.2		
1890	Windfalls	693				
1890	Planting.....			.1		
1891	Planting.....			.2		
1892	Planting.....			.1		
1893	Planting.....			.1		
	Total.....	33,084	12,549	4.4		



Young and mature Norway pine on a school section (about 10 miles to the State of Minnesota by the United States) in Bollinger State.

REGENT FORESTRY LEGISLATION IN MINNESOTA.

The State of Minnesota ought soon to be in the front rank in forestry. There are but very few states in which the people generally are so well informed on forestry as in Minnesota; still a great deal more needs to be done for the diffusion of popular education on the subject. Both of the two last legislatures have done a little for forestry; that of 1899 created the State Forestry Board; that of the present year passed an act turning over to the forestry board, for forestry purposes, a few lands forfeited for non-payment of taxes. There have not been wanting earnest friends of forestry in the legislature, but the session is so short, there is so much to do and the leading members are so engrossed with matters to which they must give the preference that forestry has received but scant consideration. Not till the cause of forestry has a champion in each branch of the legislature who is competent and determined that the subject shall receive due consideration will any important progress be made. It depends on the people to see that this shall be brought about.

The State Forestry Board had a bill drawn and introduced placing under the charge of the board such non-agricultural lands as have been forfeited to the state for non-payment of taxes and providing that the attorney general should take proceedings to quiet the title to the lands in the state. Ahead of this bill there happened to be one which was passed (chapter 319) providing that lands which had been bid in for the state under the provisions of Chapter 322, General Laws, 1899, might be redeemed on payment of fifty per cent of the taxes and charges due thereon. The friends of this bill insisted with success on amending the forestry board bill so that it should apply only to lands forfeited prior to 1891, and which takes out from the bill nearly all of the forfeited lands,

leaving only probably two or three thousand acres. A member from the northern part of the state also insisted upon an amendment that the bill should apply only to lands "totally" unfit for agriculture and that the county commissioners of the county in which the lands are situated shall determine as to the character of the lands. It being late in the session the friends of the bill thought it unadvisable to oppose any of those amendments. The act will perhaps prove valuable in testing the principle as to whether lands forfeited for non-payment of taxes can be devoted to forestry purposes. Probably it will be valuable as showing what cannot be done for forestry. The following is the act:

FORFEITED LANDS FOR FORESTRY PURPOSES.

Chapter 335.

An Act to Set Apart and Appropriate Certain Tax Title Lands for State Forestry Purposes, and to Provide for Quieting the Title Thereto in the State, and to Appropriate Money for the Expense Thereof.

Be it enacted by the Legislature of the State of Minnesota:

Section 1. All lands (excluding all lots and land within the corporate limits of any incorporated city or village or in any platted townsite) which were offered for sale under the terms of chapter 135 of the General Laws of the State of Minnesota of 1881, which is entitled "An Act to enforce the payment of taxes which became delinquent in and prior to the year one thousand eight hundred and seventy-nine (1879)," or under the terms of chapter 150 of the General Laws of Minnesota, for 1893, entitled "An Act to enforce the payment of taxes which became delinquent in and prior to the years 1879 and 1889," or under the terms of chapter 322 of the General Laws of the State of Minnesota of 1899, which is entitled "An Act to enforce the payment of taxes which became delinquent in and prior to the year one thousand eight hundred and ninety-seven (1897)" and which lands were not sold to any person or corporation at either of the public sales authorized by one or the other of the above entitled acts, but which lands were bid in for the state under the terms of said chapter 322 of the General Laws of Minnesota of 1899, or became the property of the state under the terms of and in the manner provided by said chapter 135 of the General Laws of Minnesota of 1899, or became the property of the state under the terms and in the manner provided by said chapter 135 of the General Laws of Minnesota of 1881 are hereby set apart and appropriated to state forestry purposes, and said lands are hereby declared to be a part of the "Forest Reserves" of the state, to be managed and controlled as herein provided, or as the legislature may hereafter provide, from time to time; provided that no tract or parcel of said lands which has been heretofore redeemed, or the state's interest therein has been assigned to any person or corporation by any officer of the state or of any county, or afterward sold, at any tax sale, to any person or corporation,

shall be included in the provisions hereof; provided further, that no part of said lands shall be so set apart and appropriated to such forestry purposes, except such lands as became delinquent prior to the year 1891 and to which the state has not disposed or may not before the proceedings hereinafter directed are begun, dispose of its interest. Provided further, that no agricultural lands or lands suitable for agriculture shall be set apart or appropriated to state forestry purposes under the provisions of this act, and only such lands shall be so set apart and appropriated to forestry purposes as are totally unfit for agricultural purposes. Provided further, that before any lands are set apart and appropriated for state forestry purposes under the provisions of this act the proposition to set the same apart for such purpose shall be submitted to the board of county commissioners of the county wherein such lands are situate for the purpose of ascertaining whether such lands so proposed to be set apart are agricultural lands or are lands totally unfit for agriculture. If such board of county commissioners shall report and certify such lands to be unfit for agriculture then the same may be set apart as herein provided. One-half ($\frac{1}{2}$) of the moneys realized from the income from said lands shall go to the state, one quarter ($\frac{1}{4}$) each to the town and county where the land is situated.

Sec. 2. The attorney general or county attorney, at his request, shall serve notice of the termination of the period of redemption, upon those in possession of and upon persons against whom said property is assessed in the manner provided in sections 1654 and 1660, General Statutes 1894, and thereby perfect title in the State of Minnesota of the lands in question.

Sec. 3. The attorney general of the state is hereby charged with the duty of bringing actions in any case in which the same is necessary, in the name of the state to quiet title in the state to each parcel or tract of such land, provided that he shall not be obliged to bring more than three hundred (300) of such actions in any one year; and provided that the attorney general may appoint the county attorney in any county where such lands are situated to represent him in any such action, at a cost not to exceed five dollars for the work performed by such county attorney, the attorney general to prepare and furnish blank forms for such actions, and it is hereby made the duty of every county attorney so appointed to promptly carry out the instructions of said attorney general.

The attorney general or the respective county attorney at his request shall only be obliged to bring such actions on the written request of the "Minnesota State Forestry Board" embodied in a resolution describing such lands, and certified by its president and secretary.

Sec. 4. When the title to any such tract or parcel of land has been so quieted in the state, the attorney general shall certify to said Minnesota State Forestry Board that such title has been so quieted in the state, describing the land, and thereupon and thereafter all such tracts or parcels so certified to said board by the attorney general shall become and be a part of the "Forest Reserve" of the state and shall thereafter be under the control, care and management of said "Minnesota State Forestry Board."

Sec. 5. There is hereby appropriated out of any moneys in the state treasury not otherwise appropriated the sum of one thousand (\$1,000) dollars annually for the purpose of paying the expenses incurred by the attorney general in bringing the actions to quiet title in the state, to said lands as hereinbefore provided, but no part of said sum shall be paid out except upon vouchers approved by the president and secretary of the Minnesota State Forestry Board and certified by the attorney general.

Sec. 6. This act shall take effect and be in force from and after its passage.

Approved April 13, 1901.

RECOMMENDATION OF NEW LEGISLATION.

For the first two years that the fire warden system was in operation the appropriation for each year was \$6,000; but as the money was not all expended the legislature of 1897 reduced the appropriation to \$5,000 a year, at which it still remains. This amount has to pay one-third of the expenses which the various counties incur for paying the local fire wardens and for help in extinguishing fires, the salary of the chief fire warden, the expenses of his office, including printing, and is insufficient. This appropriation does not permit the chief fire warden to use necessary means for detecting and punishing violations of the fire warden law. The appropriation ought to be \$2,000 more than it now is. It is not fair to require an officer to enforce a law without giving him the means for doing so.

I think the Fire Warden Law could be improved by affording the fire wardens more inducement for activity in patrolling their territory in dangerous weather. I do not think their pay is quite enough. There are a few other improvements that could be made in the law. It should be specifically made the duty of a fire warden where there are probable grounds for believing that a party wrongfully caused a fire, to immediately go before a justice of the peace, make complaint and have the offender arrested. Also I think it would be well in case of conviction for the person making the complaint to receive half of the fine.

It was supposed that under the act creating the Minnesota State Forestry Board considerable cut-over land unfit for agriculture would be donated to the state for forestry purposes. Ex-Governor John S. Pillsbury has donated to the state 1,000 acres of such land, which is all that has been thus far donated. If the forest resources of the state are to be perpetuated it will be necessary for the legislature to appropriate money for the purpose of purchasing land that is only fit for growing timber. I

would recommend an annual appropriation of \$50,000 for such purpose and that the State Forestry Board be authorized to begin the work of planting the land with pine. Naturally no one tract would be very large. The act creating the forestry board makes town boards of supervisors forestry boards and requires that they be consulted in the selection of lands for forestry purposes. The lands would be largely under the care of local boards whose principal work would be to protect them from fire. It would be about a generation before the pine would be worth stealing, and in that time a public sentiment would have grown up whereby the property would be comparatively safe from trespass.

It is to be hoped that the new tax commission will recommend some change in the tax laws whereby encouragement shall be given to private owners of non-agricultural land for utilizing it in the production of timber. I would recommend an amendment to the constitution in substance as follows:

Land which is unfit for agriculture and on which forest is systematically grown in good faith on tracts of not less than forty acres shall be exempt from taxation; but the forest crop on such land shall be taxed according to its value when it has reached merchantable size; and the tax shall be a lien on the land. Provided, that any land on which the branches and tops of felled trees shall remain after six months from the time the trees were felled shall be assessed and taxed as other land is assessed and taxed.

Respectfully submitted,
C. C. ANDREWS.

